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# *CRUSTACEA AND SPIDERS*

BY F. A. A. SKUSE

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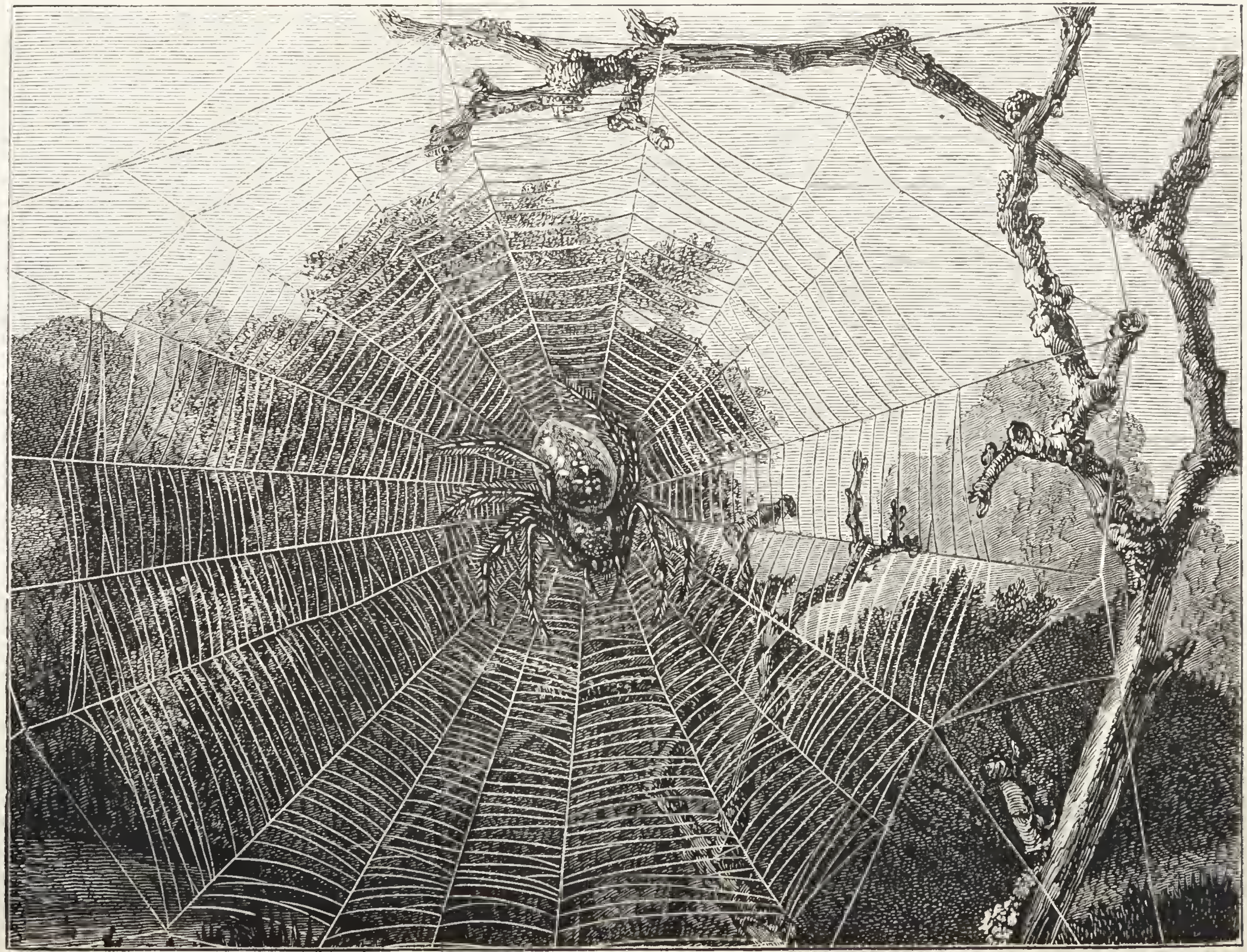

THE COMMON GARDEN SPIDER (EPEIRA DIADEMA).

THE YOUNG COLLECTOR.

# BRITISH STALK-EYED CRUSTACEA AND SPIDERS.

## *WITH AN ACCOUNT OF THEIR STRUCTURE, CLASSIFICATION, AND HABITATS.*

BY

F. A. A. SKUSE.

ARDVA · QVÆ · PVLCRA

LONDON:
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# PREFACE.

MORE than one hundred stalk-eyed Crustacea, and between four and five hundred spiders, are known to collectors as British. In consequence of these large numbers, it is only possible to admit the description of a very small portion of our indigenous species into the narrow limits of this book; but it is hoped that an acquaintance with those creatures which have been selected as examples will prepare the student for the reading of more extended works.

After the reader has acquired, as I trust he may be able to do, a sort of bird's-eye view of the characteristics of Tribes and Families, he may put this unpretending little volume aside, and turn to the perquisition of works devoted to the elucidation of genera and species.

Of the works consulted, the author must here express his indebtedness to those of Huxley, Nicholson, Bell, Blackwall, Milne-Edwards, Latreille, Simon, Dallas, Woodward, Lister, Stavelay, and White. He must also acknowledge his obligations to Mr. Sinel, of Jersey, for much valuable information embodied in the chapter devoted to "collecting."

F. A. A. SKUSE.

LONDON, 1886.

# CONTENTS.

PAGE
INTRODUCTION . . . . . . . . . 9

CHAPTER I.

PARAPHERNALIA REQUIRED BY COLLECTORS . . 16

CHAPTER II.

DEVELOPMENT. PART I., CRUSTACEA . . . 25
,, ,, II., SPIDERS . . . . 38

CHAPTER III.

HABITATS AND HABITS. PART I., CRUSTACEA . . 44
,, ,, ,, II., SPIDERS . . 65

CHAPTER IV.

CLASSIFICATION. PART I., CRUSTACEA . . . 83
,, ,, II., SPIDERS . . . . 103

CHAPTER V.

COLLECTING . . . . . . . . . . 111

CHAPTER VI.

USES . . . . . . . . . . . 117

CHAPTER VII.

THE CABINET . . . . . . . . . 123

# INTRODUCTION.

"NOTHING can be unworthy of being investigated by man, which was thought worthy of being created by God."—BOYLE.

"WE eat dressed crab, and lobster salad, and refresh our wearied brains with the stores of phosphorus they contain ; yet those brains give little thought to the strange, unseen life of these creatures, which by hundreds of thousands are caught for us by toiling fishermen in British seas, while 600,000 lobsters are yearly brought from Norway to eke out our supply."—FRANK BUCKLAND.

OUR first acquaintance with crabs and spiders dates from times of remote antiquity, and their histories have been made the subject of many curious fables. The crab figures in the hieroglyphics of the ancient Egyptians and the tesselated pavements of the Romans. Truthful representations of some may be seen on many of the medals and monuments of the Greeks. Hippocrates makes mention of certain crabs used in the treatment of disease. Apicius, a famous glutton of Rome, was very fond of crab, and he has handed down to posterity many elaborate receipts for its preparation as a tempting dish. The spider may boast of an equally ancient lineage. We all know the fable of Arachne, the Lydian virgin who was transformed into a spider for contending with Minerva at spinning. The oldest of books, the Bible, mentions our friend the spider three times.

These interesting creatures then ought almost to be held in veneration on account of their patriarchal reputation. Surely we may gather tales of them from the very "cobwebs of antiquity."

Everybody knows a crab. Everybody knows a spider. But it is just these every-day things that people know really least about; while, on the contrary, things that must be sought for in order to be seen are often most commonly known.

There are no branches of natural history more interesting, and few more within the reach of students, than those treating on the Crustacea and the Arachnida. Wherever there is land spiders may be found; and wherever there is sea, indeed water, Crustacea of some order or other may be discovered. Yet, strange to say, there are few classes of animals that have been so neglected by naturalists. It is true there exist some masterly monographs upon both, but these are few and expensive, and I am not aware of any that would meet the requirements of the beginner.

Let us walk into the parlour of the spider, let us visit the haunts of the crab, and I am sure that many will be led to a deeper study; a desire will be developed in the minds of not a few to inquire more carefully into the lives of these but poorly appreciated creatures.

Amongst the living objects that force themselves on the notice of one who walks on the borders of the sea, the various Crustaceans are perhaps the most conspicuous. The spiders are equally popular, but I regret to think that this popularity does not generally extend in the right direction. "Wretched creature!" and "Dreadful thing!" are fair samples of the exclamations which emanate from the common observer, without any provocation. I would ask the disgusted one a question. Has not the great Creator proclaimed them "good"? Then why should not we, in all due respect and charity, being cognizant of our shortsightedness and unfounded prejudices, wait until at least a slight acquaintance is made of these charming beings, before lending our voice to such expressions of disapprobation? The spider, so unjustly traduced by a vulgar prejudice, evinces a parental affection becoming to some human beings. There is a spider common under clods of earth (*Lycosa saccata*), which may at once be distinguished by a white, globular, silken bag, about the size of a pea, in which she has deposited her eggs, attached to the extremity of her body. Never miser clung to his treasure with more tenacious solicitude than the spider to her bag. Though apparently a considerable encumbrance, she carries it with her everywhere. If you deprive her of it, she makes the most strenuous efforts for its recovery; and no personal danger can force her to quit the precious load. Are her efforts ineffectual? A stupefying melancholy seems to seize her, and, when deprived of this first object of her cares, existence itself appears to have lost its charms. If she succeed in regaining her bag, or you restore it to her, her actions demonstrate the excess of her joy. She eagerly seizes it, and with the utmost agility runs off with it to a place of security. I might fill a volume like the present with eulogy of the spider and the crab, and I entreat the reader to search for himself into the lives of these humble creatures; he will find that an attentive eye cannot fail to acquire information, and that a whole life passed in research would fail to exhaust the pleasure derivable from study of Crustaceology and Arachnology; indeed, the investigation of a single species, its instincts and other miracles of its history, could be but imperfectly pursued in a lifetime.

Besides their historical antiquity, the Crustacea and Arachnida have a great geological antiquity. It may be interesting, and not out of place in our introduction, to give a slight account of the distribution of their fossil remains in times far previous to the advent of man upon our globe.

Crustacea have been discovered as far back as the Lower Cambrian period. These rocks are well exhibited in the neighbourhood of St. David's, in South Wales, and near Dolgelly and Maentwrog, in North Wales. The *trilobites*, deriving their name from the obvious three-lobed-like aspect of their bodies, are the most ancient of all the Crustacea, and abound in these rocks. Some forms are of large size; *Paradoxides Davidis*, the largest *trilobite* known in Great Britain, nearly two feet long, is peculiar to this formation.

"Seated on some ancient promontory of the Laurentian, and looking over the plain, which in the Primordial and Lower Silurian periods was the sea, I have often wished for some shred of vegetable matter to tell what lived on that land when the Primordial surf beat upon its shore, and washed up the trilobites and brachiopods of those old seas; but no rock has yet taken up its parable to reveal the secret, and the Primordial is vocal only with the old story: 'And God said, Let the waters swarm with swarming living things: and it was so.' So our picture of the period may represent a sea-bottom swarming with animals of low grade, some sessile, some locomotive; and we may merely suppose a distant shore, with vegetation dimly seen, and active volcanoes; but a shore on which no foot of naturalist has yet trod to scan its productions."[1]

---

[1] DAWSON: "Story of the Earth and Man," p. 52.

Passing upward into the Silurian ages, we meet with the *trilobites*, continued from the Primordial in great and increasing force, and represented by many and beautiful species; while they are provided with powerful limbs, long, flexible bodies, and large eyes, and are sometimes of large size.

A decadence of the *trilobites* is observed in the Devonian age, which may be accounted for by the introduction of numerous formidable fishes. Some, already strong in the Silurian, were armed with new and dreaded powers. Fragments of a huge Crustacean (*Pterygotus anglicus*) have been met with from time to time in this formation. They are called by the quarrymen the "seraphim," from the winged appearance of the thoracic appendages. The fossil restored would measure about six feet in length, and more than a foot across. The largest Crustacean living at the present time is the *Inachus Kæmpferi* of De Haan, from Japan, remarkable for the extraordinary length of its limbs; the forearm measuring four feet in length, and the others in proportion, so that it covers about twenty-five square feet of ground.

The earliest known insects have been found in the Devonian, so probably there also existed spiders, though I do not know that any remains of them have yet been found in these rocks.

The great Crustacea of the Palæozoic age began to diminish in size and number during the Carboniferous period; the meridian of *trilobite* life is evidently passed.

"Thou takest away their breath, they die,
They return to their dust;
Thou sendest forth Thy spirit,
They are created;
Thou renewest the face of the earth."

A few species of scorpions and spiders, very like those of the modern world, have been found in the coal measures; so that while we know of no enemy of the Devonian insects except the fishes, we know an addition to these in the Carboniferous—the spiders and their allies.

Passing over the Permian, devoid of *trilobites* and the curious Crustacean forms that characterized the Devonian and Carboniferous epochs, we come to the Mesozoic ages. No *trilobites* or strange-looking Crustacea are found. If the ordinary observer could be shown a quantity of Jurassic or Cretaceous crabs, lobsters, and shrimps, he would not readily recognize the difference between them and those inhabiting modern seas. Crustaceans of minute forms are abundant in the fine-grained limestones: crayfish-like forms also occur. The Lias beds of the midland and south-western districts of England are crowded with the remains of insects, spiders, and Crustacea, referable to existing genera.

I will close this introductory chapter with a few observations that the young student, of any branch of natural history, will do well to remember. There are two principal avenues to knowledge—the study of words, and the study of things. In the words of a celebrated naturalist, "to account the mere knowledge of words as wisdom, is to mistake the cask for the wine, and the casket for the gem." Mere book knowledge, however learned the author, will not teach any branch of science. The following pages do not profess to be either scientific, or in the least anything beyond the production of a humble admirer of nature, and are only intended to put the reader on the road to the investigation of the creatures written about. With this, as nothing more than a sort of guide-book, let the student, with enthusiasm, industry, and intelligence, search out and admire the various forms of crab and spider life, without unnecessary cruelty and destruction of lives; and he will, ere he is long launched on this interesting inquiry, be led to exclaim with the psalmist, "O Lord, how manifold are Thy works! In wisdom hast Thou made them all."

# CHAPTER I.

## *PARAPHERNALIA.*

It is supposed that the tyro is full of enthusiasm, and is impatient to begin to study both the Crustacea and spiders. Let it however be a lasting feeling, not in the least diminished by a few opening blunders and failures, should he experience any.

> "If at first you don't succeed,
> Try, try, try again."

Before beginning to collect, it will be necessary for the tyro to provide himself with a few simple appliances for the capture and preservation of his specimens, and in the choice of these a great deal of his future success depends. First then as to the outdoor apparatus required for collecting Crustacea. This consists of a net, a satchel or bag lined with oilskin, two tin cans, and two large medicine bottles. It may be perhaps only necessary to take one of the latter on a collecting expedition, as will presently appear. There is yet one more contrivance, but this will not be required by the student during his first season's collecting. I will describe that last.

The net, as shown in the accompanying cut, which almost explains itself, is a most efficient instrument for the capture of the small Crustaceans found in the rock-pools, bays, and inlets of the coast line. The frame of the net should be made of tough iron, flat, and turned up, as at W. Small holes must be drilled at short intervals all round the frame, so that ordinary copper bell-wire may be passed through, with which the bag of the net is fastened to the frame. Three inches of spike must be left at the joining of the ring, to fix into the end of the net-pole. Before boring or burning the hole for this, an iron or brass ring, the wider the better, must be fitted tightly at the end of the stick, in order to prevent splitting. Any blacksmith will make the frame at a nominal cost. The net should be purchased at a dealer's, or, if the student possess the art of netting, he may make one for himself. It must be made of stout string or cord, and the mesh not larger than a quarter of an inch, and should taper as at X. A good size is about twenty inches in circumference, and about twelve inches in depth. Of course the frame must be made to suit the net, or *vice versâ*. The pole (Y) is best made of some well-seasoned wood,—ash or holly is very good; and for more conveniently introducing the net into the rocky lurking-places of our "crusty" friends, it is a good plan to have the pole bent, as at Z. The stick should be made up of two lengths, each four or five feet long. These may be joined, when a long handle is required, by means of a brass

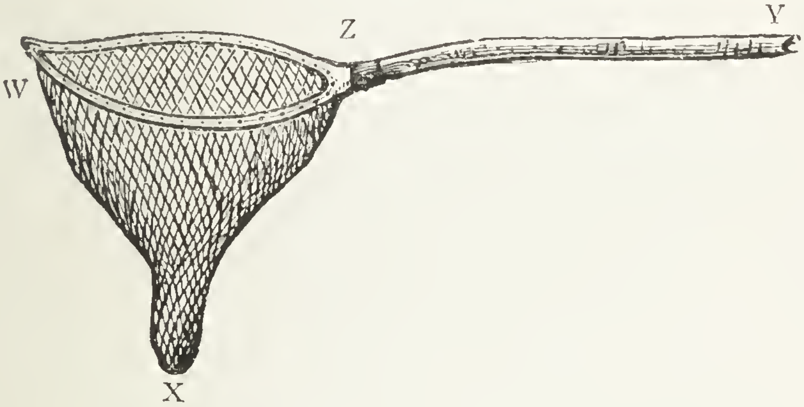

FIG. 1. Crab Net.

screw on one fitting into a ferrule fixed at the extremity of the other stick. When the extra joint is not wanted for increasing the length of the net handle, it may be advantageously used for probing the crevices between rocks, too small or narrow to admit the net. This form of net will be found to answer all ordinary purposes admirably, but the student may possibly wish to design one for himself.

The satchel is used for stowing away specimens as they are killed. It should be provided with a strap to sling over the shoulders, and, as already mentioned, lined with oilskin. The oilskin is placed inside to prevent superfluous water damaging the dress of the collector, should he be fastidious in this respect. I need hardly mention that he should always select his worst suit of clothes to go on a crabbing campaign, for more reasons than one. The satchel must be of a rather large size, as it will have to carry the two medicine bottles above-mentioned, besides the specimens. A pocket should be made at each end of the bag, to contain the bottles, but not large enough for them to fall out. The reader doubtless wonders for what the bottles are. They are used for holding water and methylated spirit respectively, employed in killing specimens, and therefore a very essential part of the equipage. Captures should be all killed on the spot, and here the collector will experience the most difficulty in treating with his treasures. Some are killed by immersion in fresh water, others by plunging into ordinary methylated spirit. The spirit would of course despatch any Crustacean; but then, like boiling water, it reddens some species, making them quite useless for the cabinet. Species that have purple, blue, or green about them are sure to turn. The following list of *genera* (for which refer to chapter on classification), must be killed in water, which will be found more expeditious in its effects if previously boiled; all others, I think, may be spirited with impunity.

| | |
|---|---|
| Palæmon | much. |
| Hippolyte | ,, |
| Anthanas | ,, |
| Homarus | ,, |
| Palinurus | slightly. |
| Scyllarus | ,, |
| Galathea | much. |
| Portunus | ,, |
| Carcinus | ,, |
| Pirimela | ,, |
| Cancer | slightly. |

The tin cans are enlisted into service on the hunting ground, as receptacles for the water and spirit. They need not be very large or cumbersome, and should be so selected that one may fit inside the other. When the collector has found a suitable spot for his operations, the cans and contents should be placed in a convenient situation near at hand, ready to receive contributions. Having killed the specimens, it is best to wrap up each, separately, in wool or seaweed, before packing them into the satchel. If there be any fresh water in the vicinity of a locality to be visited by the collector, it is obviously unnecessary to carry both bottles.

We now come to the last article for out-door use; *viz.* the dredge. At the outset I wish to impress upon the tyro, that a dredge is not absolutely necessary, although a favourable method of obtaining Crustacea. In the second place, its manipulation is quite as much as an able rower can manage. I should certainly not advise our younger collectors to "go in" for dredging, especially without a companion.

Unless cast up by a storm, or left by the receding tide in the rock-pools, many deep-water species cannot be obtained without the agency of the dredge. A great part of our present knowledge concerning the wonders of the ocean's depths has been gained since Dr. Robert Ball invented the naturalist's dredge. This has been wonderfully improved and modified, in order to meet the requirements of the collector.

The frame at the mouth of dredge should be made of galvanised iron, about eighteen inches long, by four or five inches in breadth. The scraping blades at the exterior, for more perfectly collecting the creatures at the sea-bottom, two inches in breadth. The dredge is attached to the dragging rope by double iron bridles on each side, two feet long. These are movable, and may be folded down upon one another when not in use. They are united to the cross-bars of the frame by means of rings, and to the rope in the same way.

The bag of the net should be made of strong cord, and not less than two feet deep, the meshes similar to those of the hand-net. A dredge made on these lines should not exceed the weight of five or six pounds; and this at the depth of twenty or thirty fathoms, with ten fathoms more than that of rope, is as much as one can tackle.

There is little indoor apparatus required by the collector. He will require a penknife, a little wire "hoe," a selection of gallipots of various sizes, some pieces of soft pine for setting-boards, a quantity of large and strong pins, a bottle containing a mixture of gum-tragacanth and gum-arabic dissolved in water, some powdered alum, and, lastly, some cotton wool. I will now describe the uses of these articles, and proceed to give instructions for the preservation of specimens.

Having arrived home with your captures, do not

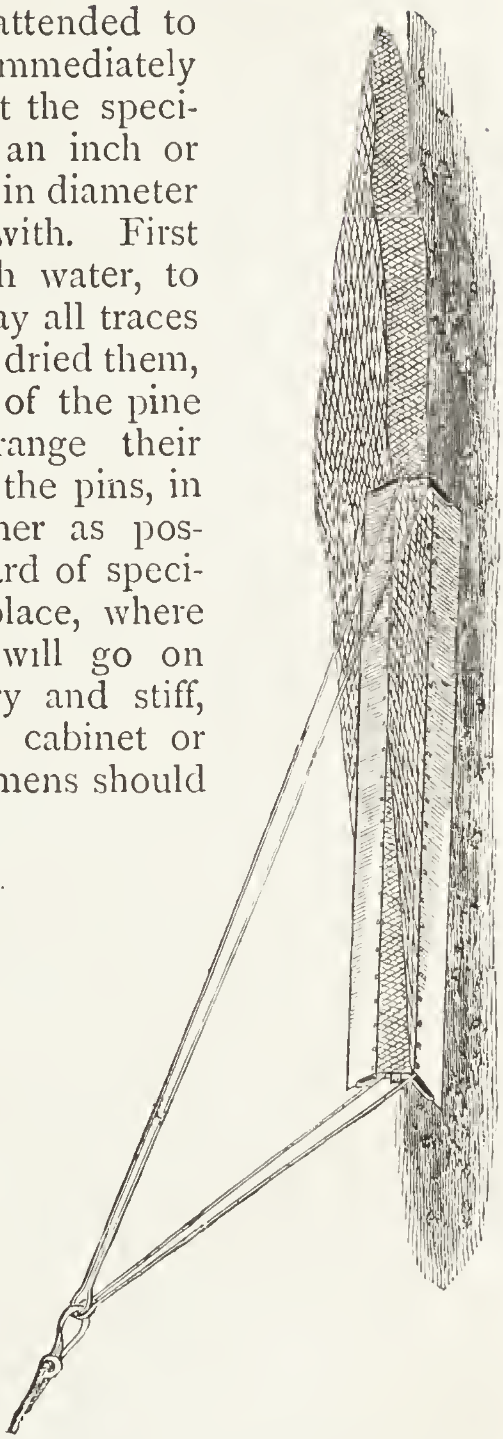

FIG. 2. Dredge.

put them aside, to be attended to at some future date, but immediately set to work and sort out the specimens. Crabs of half an inch or three-quarters of an inch in diameter may be taken to start with. First wash them well in fresh water, to clean them and take away all traces of salt. Having carefully dried them, with a soft rag, take one of the pine setting-boards, and arrange their limbs, etc., by means of the pins, in as symmetrical a manner as possible, then place the board of specimens in a cool, dark place, where the process of drying will go on evenly. When quite dry and stiff, they are ready for the cabinet or store-box. Larger specimens should (if they be crabs) have the carapace carefully removed with a knife. In the lobster forms, the abdomen or "tail" should be removed as well as the carapace. The large claws must also be detached. All this dissection should be done under water. Remove all the internal portions with the aid of the little "hoe" and penknife, and wash thoroughly in cold, clean fresh water. I want to emphasize the fact, that the inside should be perfectly cleaned out. Next dry the specimens as well as possible, as before, and then dust the inside with powdered alum. Now replace the carapace and the limbs (also the abdomen, if the specimen be a lobster), and fix them together with gum. Set them, and put them away to dry. Should the carapace be a delicate one, as that of the shrimp, it should be stuffed with cotton wool, in order to preserve its normal shape. Mr. Sinel, of Jersey, who has given a great deal of attention to the capture and preservation of the Crustacea, has kindly informed me that his method of procedure is as follows: "I macerate in fresh water for a certain time, according to the size of the specimens, from one day to a week or more in winter for large specimens, changing the water two or three times a day (as in skeleton cleaning). Then I remove the carapace in Brachyura, or the 'tail' and carapace as well in the Macroura, draw out the now soft flesh by means of a little wire 'hoe,' rinse well, dust when drained with powdered alum, and dry in a cool, brisk current of air." As I have not tried this plan myself I cannot say much about it; but this I know, having seen many of Mr. Sinel's specimens, the result is all that could be desired.

Small crabs and shrimps, when quite set, may be mounted on pieces of white card, in one or two rows, according to the number and size of the species, care being taken not to put on too much gum, making the specimens look very slovenly.

The paraphernalia required by the tyro for collecting and preserving spiders is exceedingly simple. The reader will, I almost fear, be led to think that I am slighting the spiders when I enumerate the articles; but I consider that an ill-feeling towards them on my part would rather tend to increase my list of apparatus, which, to say the least of it, is not at all conducive to the poor spider's welfare.

All that the collector will require for his outdoor work is a common insect-net and a number of glass-topped pill-boxes. The net may be purchased at any London dealer's (or "naturalist's") for two or three shillings. The great secret in making one of these nets lies in a Y shaped socket. The two upper branches of this receive the ends of a stout cane, and the lower tube, larger than the others, receives the handle. The socket may be either of brass or tin, the former being I think preferable. The net itself should be mosquito net, generally to be obtained at a good draper's shop. This material is very wide indeed, about three-quarters of a yard will make a large net, and the cost is only a shilling.

The glass-topped pill-boxes, also obtained at a dealer's, have many advantages to recommend themselves to the arachnologist. First of all, specimens may be isolated, and a nest and cocoon may be inclosed with the spider to which they belong. Another advantage is, the glass enables the collector to examine the animal alive, and observe its movements. A third is, that brief notes may be written on the box of anything remarkable in the creature's web, etc.

After the specimens have been brought home and examined, they should be killed by dropping them into boiling water. In order to preserve the specimens they must be put into tubes filled with turpentine. For these the student must again patronize the dealer; the cost is about eighteenpence a dozen. They should be of mixed sizes. When the tubes are corked and labelled, they may be either stored in trays or mounted upon cards. The latter plan is far preferable. A piece of white card, rather longer than the tube, and considerably wider, should be selected. The tube is then sewn to the card by a thread passing over it, near each extremity, and tied at the back, as shown in the illustration. It will greatly improve the appearance of the collection if all the mounting cards are of the same size; the tubes at the same time may be of various dimensions.

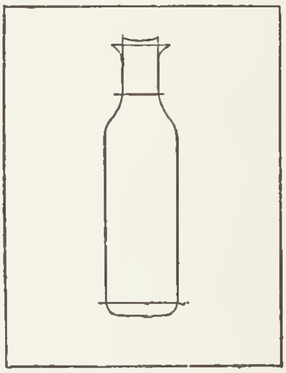

FIG. 3.

For hints on collecting I must refer the reader to the chapter devoted to that purpose.

# CHAPTER II.

## *DEVELOPMENT.*

## Part I. CRUSTACEA.

It is almost out of place to give any account of the morphology and physiology of the Crustacea and Araneidæ in a work which is intended to be elementary and popular; but a surface knowledge in this direction will materially add to the pleasure which may be derived from the study, and to the interest the intelligent student may take in these creatures.

The Crustacea, commonly known as shrimps, lobsters, and crabs, form the first class of the Arthropoda. The following definition of Crustacea is that of Professor Milne-Edwards. Animals with the body divided into rings, which are generally very distinct, movable, and horny or calcareous, without an inner skeleton properly so called, and bearing a double series of members, almost always very distinctly articulated, and forming the antennæ, jaws, etc., and legs, of which there are usually five or seven pairs. The nervous system is generally very distinct, ganglionic, and longitudinal. The respiration is in general aquatic, and is always by the branchiæ or the skin; the circulation is in general very distinct; there is almost always an aortic heart and proper blood-vessels. The sexes are separate.

Nearly all the Crustacea undergo, like insects, a series of metamorphoses after they quit the egg, so that in their early stages there is but little resemblance to the mature form. Before the year 1823 it was not generally supposed that this class of animals was subject to change of shape in its larval condition, and during its progressive development; but about this time a certain able microscopist clearly demonstrated that a minute, nondescript kind of animal, called the *Zoea*

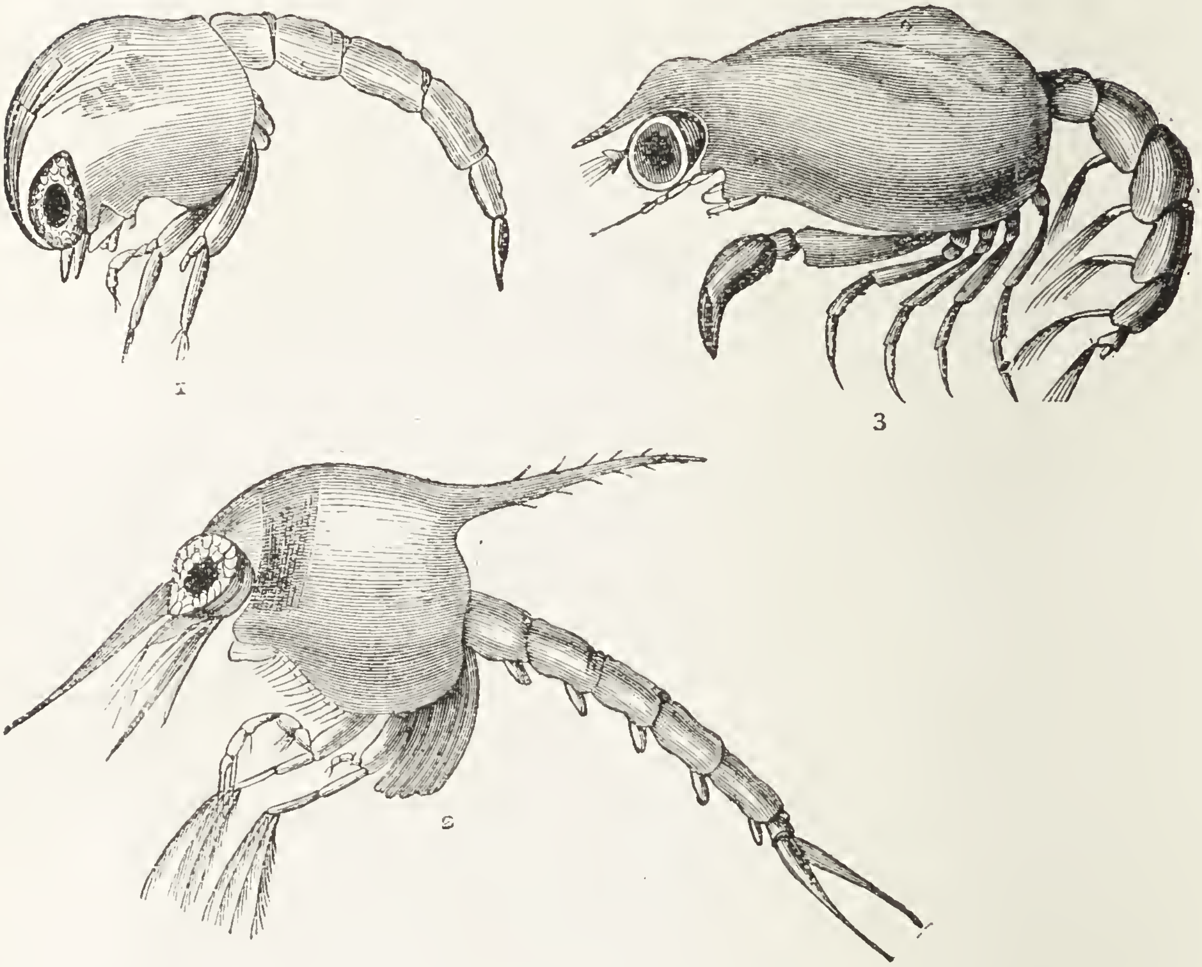

FIG. 4. The stages in the metamorphosis of the common shore crab (*Carcinus Mænas*). 1, a newly hatched Zoea; 2, a more advanced stage of same; 3, side view of still older larva. (*After C. S. Bate.*)

*Taurus*, was nothing more or less than the young of a prawn that had just escaped from the egg. This able microscopist, Mr. Vaughan Thompson, of Cork, by many successive observations, and under the fire of much adverse criticism, satisfactorily established the truth of a metamorphic change taking place in many genera, and, in particular, in the common shore crab

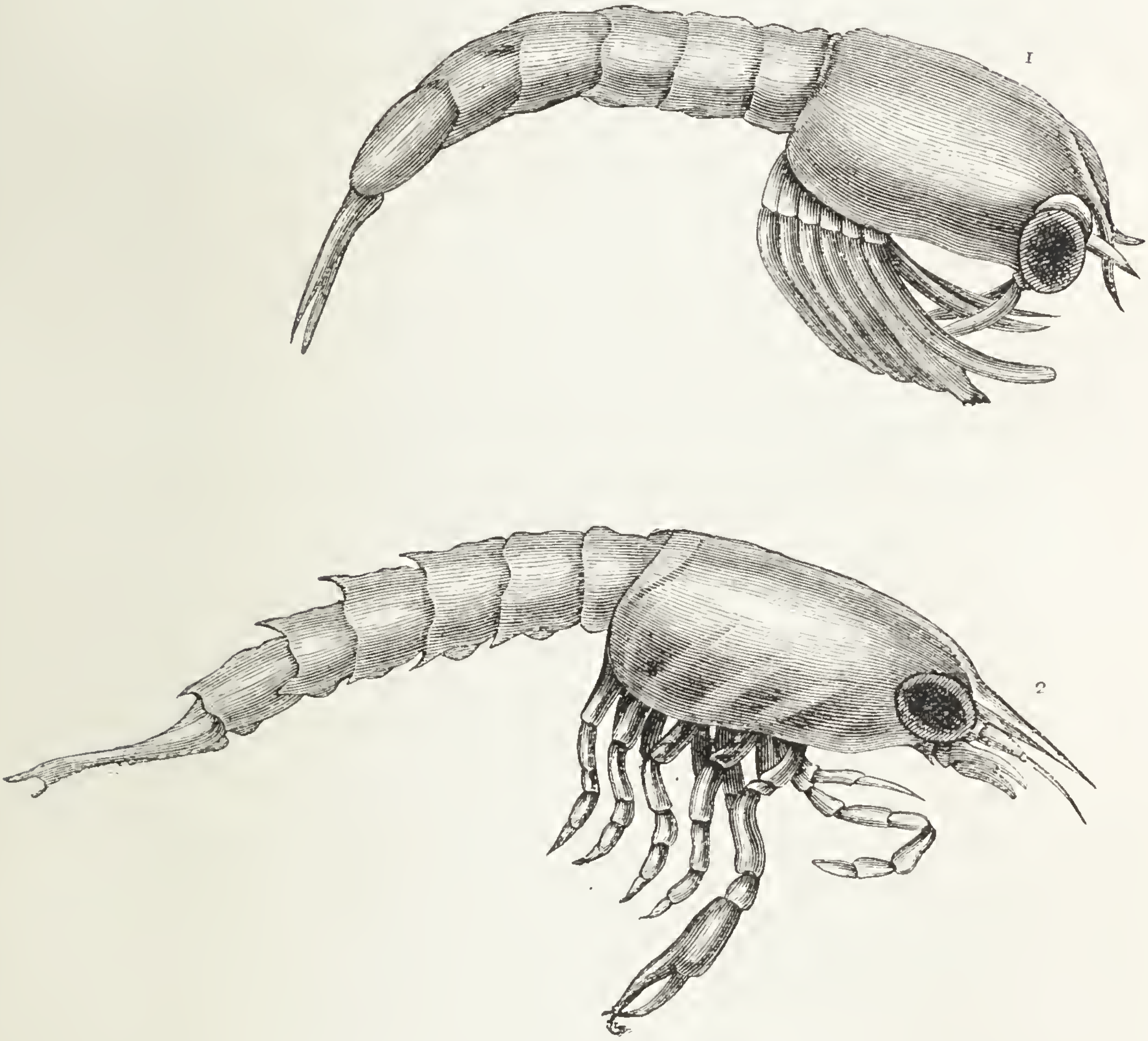

FIG. 5. Young lobsters. 1, Zoea just hatched; 2, after first moult.

(*Carcinus Mænas*, Fig. 4), having succeeded in hatching the ova of this species, the product of which proved to be a true Zoea.

On leaving the egg, the larvæ of crabs have a very grotesque appearance, as may be readily seen from our illustration; in the words of Frank Buckland, "goggle eyes, a hawk's beak, a scorpion's tail, a rhinoceros' horn, adorn a body fringed with legs, yet scarcely bigger than a grain of sand." By means of their long articulated tail, the little creatures continually turn head over heels. As the shell becomes more solid they get less active, and retire to the sand, to cast their shells, and acquire a new form. The second form is as natatory as the first. It is not until the next moult, when the little creature measures about one-eighth of an inch in diameter, that the mature form is developed. There is little metamorphosis in the common lobster, and none whatever in the crayfish.

The body of a Crustacean consists of a number of distinct pieces, connected together by means of portions of the epidermis which have not become hardened. The body of a typical Crustacean may be divided into twenty-one segments, of which, according to our present knowledge, seven must be considered as belonging to the head (*cephale*), and an equal number respectively to the *thorax* and the abdomen. Although it is true that there is not a single known species in which all these segments are found in a distinct and tangible condition, yet there is not one which may not be found distinctly formed in some or other of the species. In many Crustacea the segments of the head and *thorax* are welded together into a single mass, called the *cephalothorax;* in which case the body shows only two distinct divisions, of which the cephalothorax may claim fourteen segments, whilst the remaining seven are allotted to the abdomen. Professor Huxley divides the body into six cephalic, eight thoracic, and six abdominal somites or segments; and the terminal joint of the abdomen, termed the "telson," is regarded by him as merely an appendage. Upon this view, the body of a typical Crustacean will consist of twenty segments only; and there is a difference in the allotment of the somites. Fritz Müller regards the telson as a true somite, chiefly because the intestine usually opens in this place. Taking the whole class, the true number of segments appears to be twenty-one, each somite being formed of a body part, with its appendages. According to Milne-Edwards, "in the embryo these segments are formed in succession from before backwards, so that, when their evolution is checked, the latter, rather than the earlier, rings are those which are wanting; and, in fact, it is generally easy to see in those specimens of full-grown crustaceous animals whose bodies present fewer than twenty-

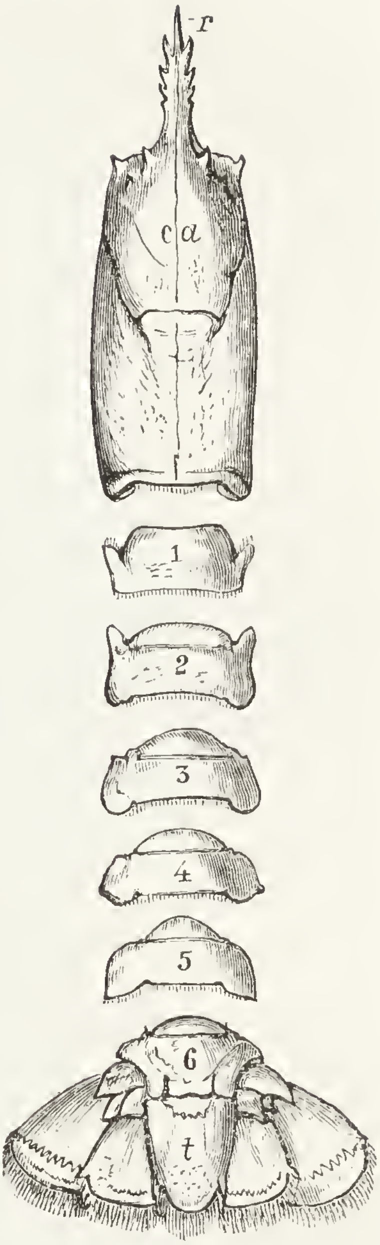

FIG. 6. Diagram of the body segments of a lobster. *ca*, the carapace; *r*, the rostrum; 1–6, rings of abdomen; *t*, the seventh and last ring, also called the "telson."

one segments, that the anomaly depends on the absence of a certain number of the most posterior rings of the body."

Taking the common lobster as a good and readily obtainable type of the Crustacea, the body to ordinary observation appears to consist of two parts, familiarly called the "head" and the "tail." The so called "head" really includes both head and the thorax, which have coalesced so as to form a single "crust," called the cephalothorax. The jointed "tail" of popular observation, on the other hand, is really the abdomen. A comparison of the crab and lobster will show obvious points of resemblance, and if examined in their young state, they will be found to present still closer resemblances. The young crab can boast of a long "tail," as well as the young lobster. In the adult crab, only a small appendage is to be observed on the underside of the creature's body, in lieu of the once possessed long "tail." Hence, practically, the full-grown crab is all head and chest, whilst the lobster exhibits a fully developed head, chest, and "tail."

If we examine the abdomen, or so called "tail," of the lobster, we can count at least six joints ; the seventh and last, marked *t* in the engraving (Fig. 6), will not at first sight be recognised as a segment. Each of the segments, except the telson, has a pair of appendages attached to it, those of the sixth, or last but one, being expanded so as to form two large flappers. If we take one of the abdominal rings and examine it, we shall observe that its transverse section will be like the accompanying figure (Fig. 7). The upper part of the circumference of the ring is called the **tergum** (back plate), the under part the **sternum** (because it exists, so to speak, in place of the breastbone of higher animals), and the part where both unite at a sharp angle is termed the **pleuron** (side-rib). In the second, third, fourth, and fifth body-segments, the appendages are in the form of swimmerets. Each swimmeret (Fig. 7) consists of a basal joint, which articulates with the sternum, and is called the **protopodite** (first foot), and of two little flappers *ex*, *en*, like oars, which are attached to the protopodite; the outer of these being called the **exopodite** (outer foot), and the inner the **endopodite** (inner foot). In the first segment of the abdomen there is only one part to represent the exopodite or endopodite. In the sixth segment the protopodite is short and wide, and its appendages (endopodite and exopodite) are broadened out so as to form the tail already mentioned. The second segment, although resembling the third, fourth, and fifth in all essential features, has the addition of a little process attached to each of the endopodites.

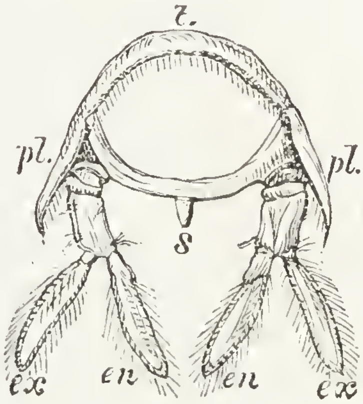

FIG. 7. The third ring of the abdomen of a lobster. *t*, tergum; *s*, sternum; *pl*, pleuron; *ex*, exopodite; *en*, endopodite.

If we examine the fore part of the exoskeleton, we find it to be made up of one piece, called the **carapace**, enveloping the fourteen divisions of the head and thorax. Hence this part of the body is called the cephalothorax (*ca*, Fig. 6). In the centre of this carapace, we see a prominent cross-groove. This groove marks the line between the lobster's head and its chest. The head terminates in a beak projecting over the eyes, and termed the **rostrum.** As there are fourteen somites covered by the head-shield, so there are also fourteen pairs of appendages.

We will first notice the appendages of the chest, or thorax, from behind forwards. There are seven pairs to account for. The last thoracic somite, or the first from the abdomen, carries a pair of the walking legs (M), each consisting of a short basal joint or propodite (*p*), and of a long jointed endopodite (*en*), the exopodite not being developed. Remembering the type joint of the abdomen, we might expect this latter appendage to appear ; it however did exist in the lobster's young state, but it disappeared in the process of modification. The next segment carries another pair of ambulatory limbs, quite similar to the last, except that the protopodite bears a process which serves to keep the gills apart, and is termed the **epipodite** (upon the foot). The succeeding segment supports a pair of limbs similar to the last in all respects, except that they are *chelate*, or clawed at the extremity. The epipodite is drawn in our woodcut (L, *ep*). The two following segments carry each a pair of chelate limbs, which are essentially the same as the last. The latter limbs, or fifth pair of legs, are those which attain such enormous dimensions, and are known as the " chelæ " proper. They differ in form, one being very ponderous and blunt-toothed, and the other more slender, and having its pincer more sharply indented.

The remaining two segments of the thorax bear each a pair of modified limbs, which are termed the **maxillipedes**, or foot-jaws. They bear a long and slender epipodite (J, K, *ep*) attached to the basal joint, and the endopodite (*en*) attains considerable size. In addition, they develop a small exopodite (*ex*) not seen in the legs, and a gill attached to the basal joint (*p*).

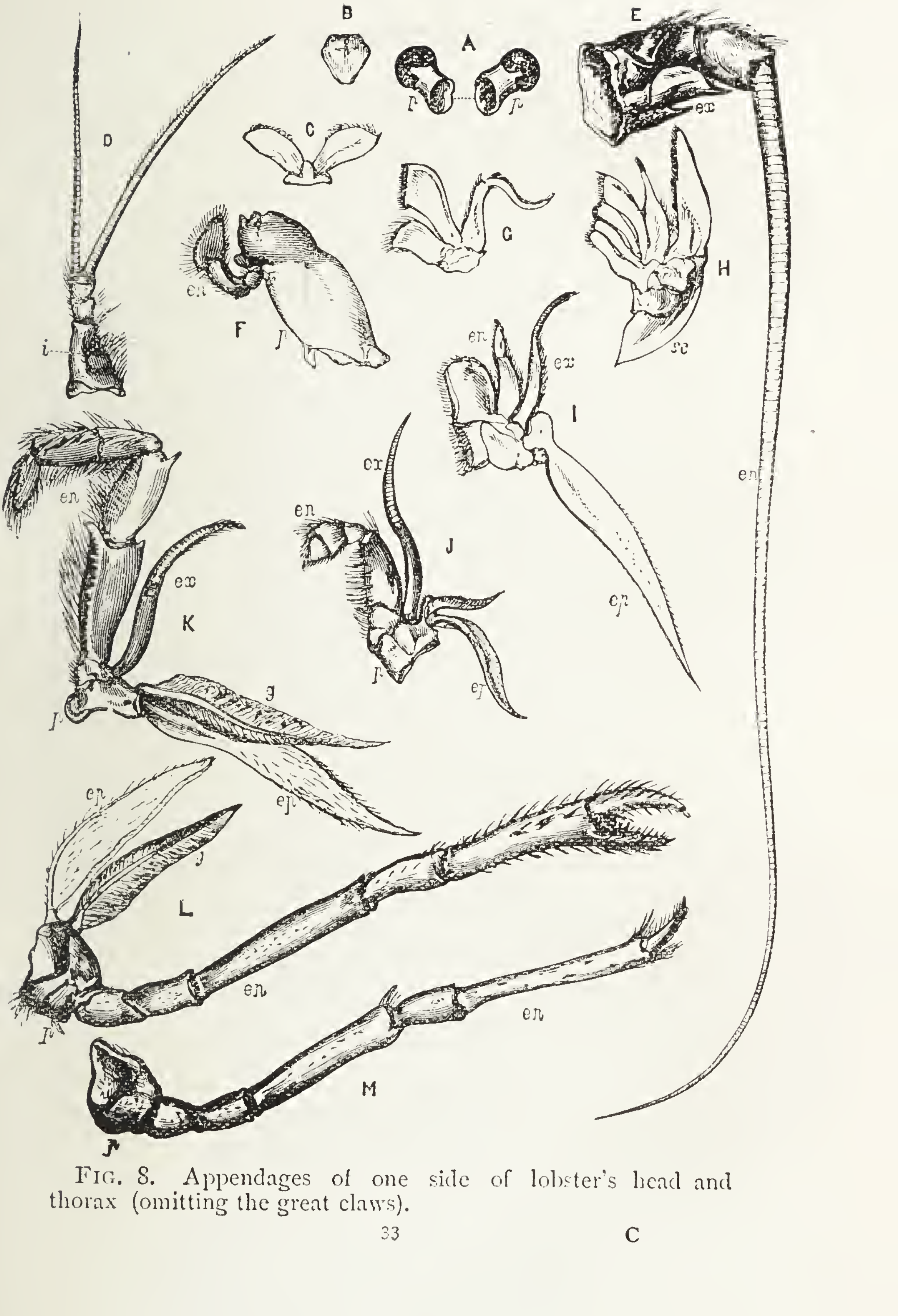

FIG. 8. Appendages of one side of lobster's head and thorax (omitting the great claws).

The appendages of the head are fitted for the mastication of food, or are organs of sense. The seventh somite bears a pair of maxillipedes, but in a more modified form than those of the thorax (I). The next two somites carry appendages, which are in the form of jaws, and are termed respectively the first and second pairs of **maxillæ** (jaws). In each jaw (G, H) we can trace all four parts—protopodite, endopodite, exopodite, and epipodite—seen in other appendages. The epipodite of the second pair of maxillæ is large and spoon-shaped, its function is to cause a current of water to traverse the gill-chamber by a baling process, and it is termed the **scaphognathite**, or boat-like jaw (H, *sc*). The next segment carries the **mandibles**, or biting jaws (F). Each consists of a comparatively large basal part, and a small, segmented endopodite (*en*), which is called the **mandibular palp** (*p*). The mouth opens between the two mandibles. The next segment bears the long **antennæ**, or feelers (E), each consisting of a short protopodite, and a long, jointed, and segmented endopodite, with a very rudimentary exopodite (*ex*). They are sometimes longer than the animal's body; often very minute in crabs. Next in forward order are the **antennules**, or lesser antennæ (D). These contain at their base (*i*), the organs of hearing; they consist of a protopodite, and a segmented endopodite and exopodite, which are nearly of equal size. The eyes are attached to the first segment of the head, each of which is borne upon an eye-stalk, or peduncle, formed by the protopodite (A, *p*).

I should have remarked before, that the mouth has a small median plate in front, called the **labrum** (B), or upper lip, and a two-lobed piece behind it, called the **metastoma** (C), or lower lip.

General enumeration of the somites and their appendages :

| | | | | |
|---|---|---|---|---|
| | 1. | Ophthalmic. | | Head. |
| | 2. | Antennulæ. | | |
| | 3. | Antennæ. | | |
| Jaws. | 4 | Mandibles. | | |
| | 5. | 1st pair of Maxillæ. | | |
| | 6. | 2nd ,, | | |
| | 7. | 1st Maxillipedes. | | |
| | 8. | 2nd ,, | | Thorax. |
| | 9. | 3rd ,, | | |
| | 10. | “ Chelæ.” | Ambulatory limbs. | |
| | 11. | Limbs | | |
| | 12. | ,, | | |
| | 13. | ,, | | |
| | 14. | ,, | | |
| | 15. | Generative Organs. | | Abdomen. |
| | 16. | Swimming feet. | | |
| | 17. | ,, | | |
| | 18. | ,, | | |
| | 19. | ,, | | |
| | 20. | Tail fin. | | |
| | 21. | (telson.) | | |

I will now proceed to briefly describe the arrangement of the organs within the body. The interior of the head and thorax is occupied by the various digestive and other organs of the creature, including a stomach, intestine—running straight along the body to the telson,—and a large liver. By cutting off the back in the thoracic region, we shall observe a bag, named the **pericardium** (round about the heart), filled with fluid; inside of it is the heart, which, by its constant pulsation, distributes pure white blood to every part of the body. One artery goes backwards, along the dorsal side; another runs forwards to supply the eyes and the front parts of the body; a third canal turns downwards, from the hinder artery, becoming what is called the sternal artery. Cutting away the sides of the carapace, we bring into view twenty gills on each side, partly attached to the bases of the legs, partly to the side wall of the thorax. Each of these little conical gills consists of a central stem, to which a large number of delicate leaflets are attached. The water which occupies the gill-chambers is renovated partly by the expanded epipodite of the second pair of maxillæ, and partly by the movements of the legs.

The mouth leads by a short œsophagus into a round stomach. The mouth, stomach, and intestines are lined with a chitinous covering. The anterior part of the stomach contains within its cavity an apparatus which assists mastication. It is provided with a set of gastric teeth, which meet each other in the middle line to crush and grind the hard parts of the food with their calcareous ridges. A sort of little sieve or strainer, formed of hairs, is placed in the lower chamber of the stomach, leading to the intestine, which prevents the escape of the coarse particles of food, until they have been perfectly crushed. The liver is a large yellowish mass, consisting of two lobes, which open by separate ducts into the intestine.

The eyes are large, and supported on "peduncles," which may be turned in various directions at the will of the animal. The cornea is divided into a number of little "facets," supposed by some to be separate eyes, which is not at all probable.

The organs of hearing are contained in a cavity closed by a delicate membrane, situated at the base of the second pair of antennæ, in the lobster and similar forms. In the crabs this is replaced by a small, movable, shelly disk, pierced with a hole, over which an elastic membrane is placed. Peculiar sacs, or bags containing fluid, in each case convey the vibrations of sound to the proper nerves.

I will not touch upon either the muscular or nervous system in the Crustacea, as I believe it would be unnecessary and inexpedient; but before closing this part of our chapter, I will say a little about ecdysis, or moulting, and reproduction.

The periodical casting of the shell, or moulting, is a very remarkable feature in the economy of these creatures. The shell is an excellent defence for the full-grown crab or lobster, but it leaves no room for growth. In order to obviate this difficulty, the crustaceans are possessed of the power of discarding their shells at certain periods; at which time also a new and larger suit is formed. Not only is the outside covering cast off, but even the covering of the eyes, the membrane of the ear, the tendons of the claws, and the lining of the stomach, with its teeth. After the old shell is removed, the animal immediately increases in bulk, the new skin allowing at first of great expansion; it however does not take long to harden. It cannot be said that the moulting takes place yearly or at any other stated time; it appears to only take place when the growth of the animal makes it necessary. A crab has been caught, the shell of which was covered with oysters of at least six years' growth. Crustacea have also the power of reproducing lost limbs, and of throwing off and renewing injured limbs.

The Crustaceans are all oviparous. In the case of the crab, the female lays eggs which have been already fecundated after their extrusion from the ovaries, whilst adhering to the abdomen of the female. The student is already acquainted with the remarkable changes of form which the young undergo.

The preceding is, I know, full of imperfection, and full of repetition; but I have sacrificed elegant writing in order to make what I want to convey to the reader more easily understood, and so prepare him for more advanced works.

## Part II. SPIDERS.

THE spider, like the lobster, is composed externally of two parts. The fore part consists of the head and thorax conjoined, or cephalothorax; the hinder part is attached to the cephalothorax by a very narrow stalk, and is called the abdomen.

As the popular notion exists that a spider is an insect, it may be worth while to glance at the distinguishing characters of the two classes. In insects, the body presents three principal divisions, the head, the thorax, and the abdomen; but in the spider tribes the head and thorax are welded into one piece. Insects, in their mature state, have only six legs, but in the adult Araneidæ eight ambulatory limbs are always present. Insects breathe by a series of tubes pervading every part of the body; but in spiders, the respiratory apparatus is in the form of **pulmobranchia**, or organs having the combined function of lungs and gills. Further, the eyes are always simple in the spiders, but both simple and compound eyes are to be found in the insects; the antennæ of insects too are represented by organs of a totally different description in the Araneidæ. Lastly, the spiders undergo no metamorphoses, as do the insects; whilst the latter never cast their skin in their adult form, nor can they reproduce lost limbs, like spiders. I need not give any further discriminative characters between the two classes, the above being the general and essential points of distinction.

The cephalothorax and the abdomen in the Araneidæ, or true spiders, show no division into segments. This is not the case with the higher Arachnida, including the scorpions, and some other families, which exhibit characters approaching the Crustacea. On the upper part of the cephalothorax, in front, are the eyes. These are generally eight in number, but sometimes only six, in all known British spiders. All the essential parts of a simple eye, the cornea, the crystalline lens, the vitreous body, are found in them, and even the choroid, which presents itself in the form of a

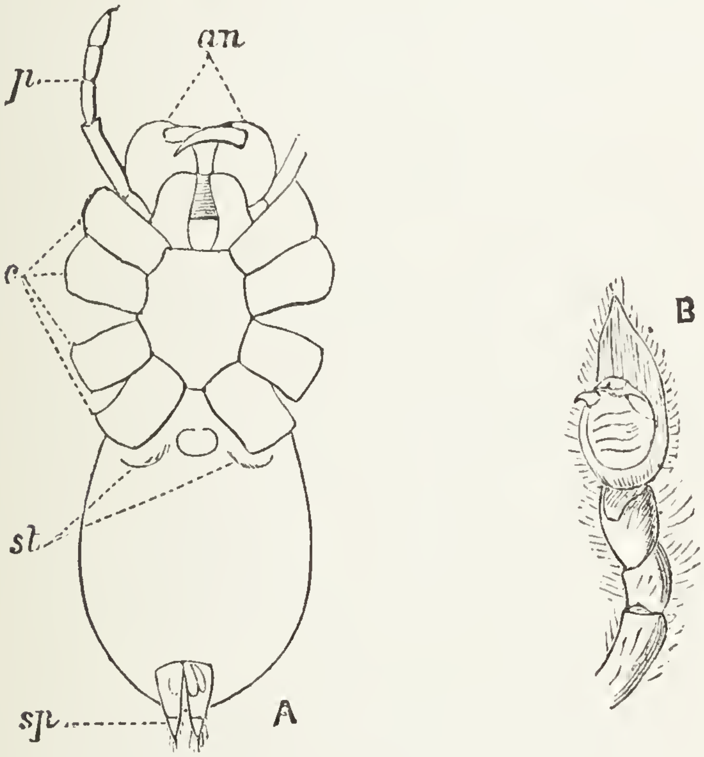

FIG. 9.—*Lycosa andrenivora.* A, under surface of female. *an*, falces; *p*, maxillary palpus; *c*, coxæ; *st*, stigmata; *sp*, spinnerets. B, maxillary palpus of male (magnified).

black ring around the crystalline lens. The disposition of the eyes is extremely varied, yet always symmetrical, and forms an important characteristic in the distinction of the genera. Spiders appear to be able to see both by day and night. The **falces** (A, *an*), or forceps, which spring from the front of the cephalothorax, above the mouth and just below the eyes, consist of two joints, of which the basal one is large and stout, and grooved along the inner edge, while the second is claw-like, sharp, and jointed to the first in such a manner that it can be folded down into the groove of the latter, somewhat like the blade of a pocket knife. There is frequently a row of teeth on one or both sides of the groove. The terminal claw-like fang possesses an aperture at its extremity communicating by a canal with a gland, which is placed in the preceding joint of the mandible, and secretes a poisonous fluid. The falces are generally bent down vertically. It is not strictly accurate to speak of these organs as jaws or mandibles, as, although they assist in eating, they form no part of the mouth. The **maxillæ**, or under-jaws, are furnished with a pair of palpi (*p*) consisting of five joints, stretching forward immediately in front of the first pair of legs. They would probably be taken for legs by an ordinary observer. The terminal joint differs widely in the two sexes: in the females it is furnished with a claw at the end; in the male the last joint is inflated, and presents a complicated structure (B). It is furnished with peculiar appendages, which are employed in the transfer of the fertilizing elements to the reproductive organs of the female. The organs of the mouth are enveloped in a sheath, formed by the **labium**, or lower lip, and the maxillæ.

We next come to the legs. These, as we already know, are eight in number. They are composed of seven joints, and are connected with the cephalothorax; the first joint is called the **coxa**, or hip; the second the **trochanter**; the third forms a well-developed **femur**, or thigh; the fourth and fifth, the **tibia**, or shank; and the sixth and seventh, the **tarsus**, or foot. The last joint has two, three, or more movable curved claws, which are often toothed like a comb. On the underside of both joints there are sometimes found pads, hairs, or spines, which can be opposed to the claws, and so form an effective "hand" for weaving.

The cephalothorax is a somewhat flattened segment. Its integument is of a harder consistence than that of the abdomen. The upper plate is called the shield, and the lower the **sternum**, or breastplate. The shield is broader than the breastplate, and overlaps it; it is also usually narrower in front, and wider and heart-shaped, or rounded, behind. The breastplate is often heart-shaped, with the apex backwards.

We will next examine the second and last great division of the spider. The abdomen varies much in form, being egg-shaped, globular, cylindrical, and in some cases nearly triangular. It often overhangs the thorax in front. Its walls are generally composed of a soft and elastic skin. On the lower side of the abdomen, near the cephalothorax, is situated the breathing apparatus, consisting of two small plates with a slit on the inner side of each of them (*st*), leading to the breathing organs situated beneath. These are the lung-sacs. But, as has been already mentioned, respiration in these animals is effected partly by lungs, and partly by gills, or branchiæ. The main passages to the latter open to the air by a pair of stigmata, sometimes close to the lung-sacs, sometimes at the extremity of the body. Between the stigmatic openings is the aperture of the generative organs. At the extremity of the abdomen are the singular organs known as the spinnerets (*sp*), forming such a leading characteristic of the order. These consist of two, three, or four pairs, varying in form and length. Sometimes they are grouped close together, sometimes not. The tips and under surface are pierced with numerous minute holes, through which issues the silk. This viscid fluid escapes in filaments of extreme fineness, but unite before they harden, to form the threads of the spider's familiar net or web.

I will now proceed to briefly describe some of the internal organs. The cephalothorax contains the stomach, main nervous masses, and the muscles of the limbs. The stomach, which is situated beneath the top surface of the cephalothorax, is composed of two principal parts placed one above the other. The upper portion of the stomach is in the form of an annular tube, from each side of which proceed five tubes, which bend under, and then enter the lower stomach. Almost the whole nutritive process is carried on in the stomach, for only a narrow prolongation of it is carried into the abdomen. In its course it receives ducts from the liver-fat masses, yet it runs as a short, straight intestine to the extremity of the body. Between the stomachs lies a solid mass, and to this a muscle is attached, which passes through the central orifice of the upper ring-like portion, to be attached to the dorsal shield above. The contraction of this muscle, compressing the upper stomach, forces its contents through the side tubes into the lower stomach, whence they pass into the alimentary canal.

A four-chambered heart lies immediately under the skin of the back of the abdomen. The chambers are placed in a longitudinal series, and the blood is propelled forwards. From the chamber nearest to the cephalothorax proceeds the aorta, or artery, which extends through the stalk connecting the abdomen with the cephalothorax, and is there divided into three pairs of vessels. The top pair goes to the eyes and the organs of the mouth, the middle pair to the stomach, and the lowest pair sends blood to the legs. The blood from these is collected again into one large aorta in the fore part of the cephalothorax, and flows through a long, central vessel to the spinnerets, sending out in its course a supply of blood to the breathing organs. After this the blood is again collected and goes through a number of channels along the sides of the abdomen; it then returns and re-enters the heart. The blood is a colourless liquid.

The silk-secreting organs are found at the extremity of the abdomen. These are special glands, which communicate with the spinnerets by small tubes.

The spiders are all oviparous, and the female, when once impregnated, produces several batches of eggs. The young when hatched resemble the adult in form and structure. The eggs are inclosed by the female in a silken bag or cocoon.

Space will not permit this subject to be enlarged upon, but I think I have written enough for the purpose of the beginner in this study; as in the part devoted to development in Crustacea, I refrain from any comment on the nervous or muscular system in the Araneidæ.

# CHAPTER III.

## *HABITATS AND HABITS.*

## Part I. CRUSTACEA.

Having roughly described the general characteristics in the structure of the crabs and spiders, and the methods of collecting and preserving the specimens, I will now briefly touch upon the leading genera with a view to giving their habitats.

Although our shores do not present us with a great variety of species of the stalk-eyed Crustacea, yet our indigenous species show a good assortment of genera.

This portion of our chapter will be devoted to the crabs and their allies. We shall commence with the lowest forms.

*Squilla desmarestii* and *S. mantis* (Fig. 10) frequent the rocks and weeds near the coast. They have been taken at Cornwall and at Guernsey. Dr. Lukis[1] has published the following observations on the habits of *Desmarestii*, previously but little known, from a specimen which he kept in a basin of sea-water for two days: "It sported about, and, after a first approach, exhibited a boldness rather unexpected. When first alarmed, it sprang backwards with great velocity, after which it placed itself in a menacing attitude, which would rather have excited the fear of exposing the hand to it. The prominent appearance of the eyes, their brilliancy and attentive watching, the feeling power of the long antennæ, evinced quick apprehension and instinct. I brought a silver teaspoon near them, which was struck out of my hand with a suddenness and force comparable to an electric shock; this blow was effected by the large arms, which were closed, and projected in an instant with the quickness of lightning. An apparent anxiety to keep the head and claws in front made me suspect that the animal lodges its hinder part in holes or recesses, from which it can strike at its prey or other passing objects."

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[1] *Mag. of Nat. Hist.*, viii., p. 464.

*Mysis chamæleon* (Fig. 11) is the most common and widely distributed of the genus. It is found in swarms at Weymouth and other parts of the coast. The *Mysididæ*, or opossum shrimps, as they are called, abound in the northern seas. The Arctic Ocean teems with myriads, forming not troops, but vast clouds, spreading over square leagues of water, and affording sufficient and most nutritive food for the whale and the prodigious shoals of salmon that visit the shores of Boothia during July and August. *Chamæleon* often reaches the length of an inch and a quarter; many other species are much smaller; some of them are rare.

The *Diastylidæ* are represented by three genera in our seas. *Bodotria arenosa* has been only taken, I believe, in the Firth of Forth and one or two other northern localities. It frequents sandy banks, and chiefly those where there is a little sea-weed. Length about four or five lines.

*Alauna Rathkii* and *Cuma Edwardsii* are found in a similar situation to the last. The Firth of Forth and Moray Firth are favourite "hunting grounds." They are generally of rare occurrence.

Few species of the family *Penæadæ* inhabit our seas. There are many more species in warmer parts of the world; many of them are found in the estuaries of rivers, and are highly esteemed as food. *Penæus caramote* is very rare; a few species have been taken on the coast of Anglesea. It is common in the Mediterranean, where it often attains the length of seven inches. *Pasiphæa sivado*, or the sword shrimp, has been frequently found at Bridgewater, in the Irish Sea, and the British Channel.

Many of the *Palæmonidæ* are found on most parts of our coast, and are much sought after and esteemed for their delicate flavour. *Palæmon Leachii* occurs at Weymouth and Poole Harbour. *P. varians* is met with on the coasts of Devon and Dorset, also the Irish coast. The Rev. Alfred Norman has found it off the coast of Guernsey. He says: "I have taken this species in great abundance at Clevedon, in a ditch far above ordinary high-water mark, of which the water was scarcely at all brackish; it was in company with myriads of *Rissoa ventricosa*. I found some also farther up a stream of clear, running water, along with *Aplexus hypnorum* and other fresh-water shells."

*P. serratus* (Fig. 12) is found plentifully on the rockiest coasts, where it seeks the shelter of large stones and weedy places. Mr. Gosse says[1]: "It is pretty to see the prawn fed. When a morsel of food is dropped through the water near its head, the excessively long antennæ seem principally to take cognizance of its presence and of its qualities. The eyes, though evidently alert, are, I think, less trusted. As the morsel comes within reach, the second feet, the principal organs of prehension, are stretched out, with the two fingers widely extended; these seize it with the most easy action possible, and in a moment thrust it towards the mouth." Vast numbers of the prawn approach the shores in their young state, and many of them are taken in shrimp nets and sold as shrimps in some parts of the coast. They are regarded by the fishermen, when young, as distinct species. The Isle of Wight and the Hampshire coast are famous for prawns.

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[1] "Aquarium," p. 173.

*Nika Couchii* and *N. edulis* are two of the rarest of our British shrimps. The Mediterranean is prolific in species of this genus; *edulis* constitutes an ordinary article of food on all its coasts. *Couchii* was first described by Professor Bell[1] from a specimen found in Cornwall by Mr. Couch. *Edulis* has been rarely taken on the south coast of Devon and in the Moray Firth.

The rocky pools on the coast of Devon and Cornwall occasionally yield *Athanas nitescens*. This is generally believed by the fishermen to be the young of the lobster. When alive it is of a dull green colour, and has well developed pincers. Length, about an inch.

Six species of the *Crangonidæ* are found on our coasts; some commonly. *Crangon trispinosus* may be taken at Weymouth and Hastings, where it is called "pug shrimp." Mr. Gosse[2] describes its manners as resembling those of its congeners, burrowing in the sand, or rather sinking into it, by a rapid displacement of the sand by means of the false feet. When alive, its colour consists of a vast number of ruddy golden stars closely set, interspersed with black and pale specks, in a pellucid gray ground. Length sometimes one inch and a half.

*Crangon sculptus* is a small species, first described by Professor Bell from specimens dredged at Weymouth. It is generally of a plain drab colour, studded with minute black dots and stellate specks of reddish brown; abdomen clouded with pale senna-brown. Two specimens have been dredged in Lamlash Bay, Isle of Arran, in five fathoms of water, with sandy ground. It is not uncommon, according to Rev. Mr. Gordon, in the Moray Firth.

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[1] "British Stalk-eyed Crustacea," p. 278.

[2] *Ann. and Mag. Nat. Hist.*, 1853, p. 384.

The common shrimp, *Crangon vulgaris* (Fig. 13), belongs to this family, and is one of the most abundant of the coast species of Crustacea. It loves sandy bottoms, in which it buries itself by means of its hinder legs. It is very common on the oceanic coast of France, where it is vulgarly called the *cardon*. Large quantities are taken in Morecambe Bay, Lancashire, the Lynn Wash, on the Lincolnshire coast, and the Thames from Gravesend to the sea. Its greatest length is two inches and a half. The absence of the serrated beak, or rostrum, at once distinguishes this from the prawn, or in fact all the *Palæmonidæ*.

*Nephrops norvegicus* (Fig. 14), mostly occurring on the Scottish and Irish coasts, is the only species of the genus; it is undoubtedly one of the most beautiful of the larger Macroura. Colour, pale flesh, with now and then a darker shade; length about seven inches. Considerable numbers are found on the coast of Norway, and it extends as far south as the Mediterranean.

*Homarus vulgaris*, the common lobster, occurs generally in clear, rocky waters. The fishermen take great numbers of lobsters in baskets made on the same principle as those used for the capture of the crab. The following is taken from an article devoted to lobsters in Dickens' *Household Words*:[1] "They are a kind of Muscovites, bristling with rage against every one,—fierce, hard, horny, and pugnacious, always tearing and rending something, and losing their limbs with as much indifference as if they belonged to some salt-water czar. . . . If you wish for evidence of their pugnacity, look at their claws; one of them is always a great deal smaller than the other. Observe the left claw, with which the lobster wards off the blows aimed at him. Examine the right or striking claw; that which now garnishes the dexter limb is not the real original cheliform, but a supplementary pair of pincers, thrown off long ago in some midnight submarine brawl. In case of emergency your thoroughbred lobster parts with a claw with as little concern as a man tearing off the tail of his coat in a hedge when a mad bull is after him. The late Sir Isaac Coffin, who used to tell a great number of odd stories, was once witness, he said, to a terrible battle between two armies of lobsters in the harbour of Halifax, in Nova Scotia. They fought, he declared, with so much fury, that the sea shore was strewn with their claws. Sir Isaac was the admiral on the station, and ever afterwards, when he saw a lobster, he pointed to the disparity between the claws in corroboration of his story." The greatest catch of lobsters is from March to August.

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[1] July 29th, 1854.

*Astacus fluviatilis*, the river crayfish, is to be found in nearly all rivers and streams throughout the greater part of Europe, concealing itself in holes, or under stones, never quitting its retreat except to search for food, which consists of small mollusca and fish; it also feeds on any putrid flesh which may lie within its reach. Colour, dull greenish-grey. The crayfish changes its shell towards the end of the spring.

The *Thallassinadæ* burrow in muddy banks or sand, and are generally to be found concealed in these retreats. A rare species, *Calocaris macandrei*, occurs at a great depth, and is obtained by dredging. It is said to occasionally inhabit a depth of no less than one hundred and eighty fathoms, in which situation it burrows in sandy mud. Found by Mr. M'Andrew in Loch Fyne and the Mull of Galloway. The colour is a delicate pink or pale rose.

*Gebia deltura* is found associated with *G. stellata* in Plymouth Sound and Moray Firth. Dr. Leach states that *stellata* "has been taken on some of the shores of Plymouth Sound under the mud of which it makes long, winding, horizontal passages, often of a hundred feet or more in length." The colour of this species is yellowish-white.

*Callianassa subterranea* frequently occurs on the coast of Devon, where it resides in similar passages to those formed by the other members of this family. First found by Colonel Montagu, at the depth of nearly two feet beneath the surface, in a sandbank in the estuary of Kingsbridge. Colour during life more or less orange, which colour it soon loses after death. Crustaceous covering very thin.

The western coasts yield great numbers of *Palinurus vulgaris* (Fig. 15), a fine lobster, inhabiting the borders of rocks. The characters of this beautiful animal are at once marked and unmistakable. Its carapace is covered with spines, antennæ very long, claws quite wanting. Some specimens in my cabinet are nearly a foot in length, but *vulgaris* has been sometimes taken fully six inches longer. Colour purplish-brown, with dull-white spots. It remains in deep water during the winter, visiting the coast on the return of spring. Although only one genus of this family is known to now survive, representatives of others are to be found as far back in geological strata as the Oolitic age.

*Munida rugosa* is an uncommon species on our coasts, as far as we can tell; as it frequents deep water it may possibly exist in greater numbers than is supposed. It is more numerous on the Irish coast. The front legs are of unusual length for the size of the animal; its general appearance is extremely elegant. Colour, dull reddish-yellow. Falmouth, Plymouth Sound, and Zetland are good localities.

The *Galatheidæ* show a decided diminution in the development of the abdomen, and an evident approach to the crabs proper. The family, in fact, seems to connect the Macroura and Anomoura.

*Galathea nexa* is frequently dredged in muddy bottoms, in from three to twelve fathoms. Specimens have been also taken on the coasts of Devon and Antrim. Other localities are the Moray Firth, the Firth of Forth, and Falmouth. *G. strigosa* is often taken in "pots," and is generally common. The claws are large and very spinous, as is a great part of the following feet; carapace corrugated, reddish brown, strikingly marked with blue. Length, about four inches. Has been found in the Moray Firth and the mouth of the Firth of Forth. *G. squamifera* occurs commonly under stones and in rock pools at low-water mark, in the south and west coast of England, also in the Firth of Forth and Ireland. The colour is dull brown; front legs wide, spiny at the sides.

*Porcellana longicornis*, although common, is frequently overlooked on account of its small size. This pretty little crab should be looked for under stones and weeds just below water mark. The colour is red to brown; legs long in proportion; antennæ very long.

*P. platycheles* (Fig. 16) is found rather abundantly on our coasts. I cannot here do better than quote the words of Mr. Kingsley.[1] He remarks: "Turn a few stones which lie piled on each other at extreme low-water mark, and five minutes' search will give you the very animal you want,—a little crab, of a dingy russet above, and so on the under side like smooth porcelain. His back is quite flat, and so are his large, angular, fringed claws, which when he folds them up lie in the same plane with his shell, and fit neatly into its edges. Compact little rogue that he is, made especially for sidling in and out of cracks and crannies, he carries with him such an apparatus of combs and brushes as Isidor or Floris never dreamed of; with which he sweeps out of the sea-water at every moment shoals of tiny animalcules, and sucks them into his tiny mouth."

We now come to a very curious race of creatures, the soft-tailed crabs. They are usually called hermit crabs, because each one lives a solitary life in his own habitation, like Diogenes in his tub; and often go by the name of soldier crabs, on account of their pugnacious habits. A fair number of species are found to inhabit our coasts, living in all kinds of shells, from the trochus to the whelk.

The limbs of the hermit crab seem well adapted to a residence in such a dwelling; the large claws differ very much in size, so that when he retires into concealment, the smaller one may be entirely withdrawn, while the larger is placed in front and used as a shield and weapon united. When the crab grows larger, he has to change his old residence for a new one. "A shell lies on the ground, and the hermit seizes it with his claws and feet, twists it about with a wonderful dexterity, as if testing its weight; and having examined every portion of its exterior, he proceeds to satisfy himself about the interior. For this purpose he pushes his forelegs as far as they will reach, and probes with their assistance every spot that can be touched. If this examination satisfies him, he whisks himself into the shell with such rapidity, that he seems to have been acted upon by a spring. Such a scene as this will not be witnessed in the sea, unless the hermit is forcibly deprived of his shell, as in the case above mentioned; but when hermits are placed in a tank or vase, they seem to be rather given to flitting."[1]

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[1] "Wonders of the Shore," p. 152.

The common hermit, *Pagurus Bernhardus* (Fig. 17), is to be found almost everywhere on our coast, living in shells of all sorts and sizes. The usual length of a full grown specimen is about five inches.

*P. Prideauxii*, *cuanensis*, and six or seven other species have been obtained occasionally, but they are rare. Most of them, if not all, occur in the Firth of Forth.

*Dromia vulgaris* may be found sparingly on all our coasts; it is very plentiful in the Channel Islands. The Sussex and Essex coasts are perhaps our best localities. The whole body of this crab is covered with dense, short, brown hair, and when the creature has drawn its legs up under its carapace, it looks almost like a velvet ball, it is so rotund. This is the only British species of the family, but various examples have been obtained from all parts of the globe.

The *Corystidæ* are well adapted to burrow in the sand. Three species are known as British; many more however inhabit foreign waters. *Thia polita* is a rather rare crab, discovered on the Irish coast, buried in the sand, by Dr. Melville. I have had the good fortune to secure half a dozen specimens; two from Tenby and four from the Channel Islands. It burrows in beds of shelly and stony gravel. The carapace has been very aptly described as being similar in appearance to a large thumbnail, fringed with hair anteriorly.

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[1] Wood: "Common Objects of the Seashore," p. 118.

*Corystes Cassivelaunus*, or Pennant's long-armed crab (Fig. 18), is a very frequent inhabitant of most parts of the British and Irish coasts. Mr. Couch, in his "Cornish Fauna," tells us that it is "scarcely common, which may be accounted for from its habit of burrowing in the sand, leaving the extremity of its antennæ alone projecting above the surface." In this singular crab, the carapace is much longer than it is broad. The front legs are very long in the male, short in the female.

*Ebalia Cranchii*, *tumefacta*, and *Pennantii* belong to the family *Leucosiadæ*, and at first sight appear to resemble each other so closely as to justify an assumption that they were mere varieties of a single species; a closer examination however will discover several distinct characteristics. The limits of this work will not admit of our giving an account of the differences, as they cannot be described briefly. *Cranchii* is to be obtained in Plymouth Sound and the Moray Firth. The other species are by no means uncommon; they have been found on many parts of our coast. Mr. Gosse, in his "Aquarium," gives an account of *Pennantii.* He describes it as "inert, folding its legs on itself when touched, and remaining motionless for some time. It buries itself in the gravel, descending backwards; this is a somewhat slow process, suited to its usual phlegmatic habits. It brings its hindmost pairs of feet on each side together, then thrusting down their united points opens and expands them, forcing apart the gravel; at the same moment the posterior part of the body is brought down into the hollow thus made, and the action of the feet is repeated. The process is continued until the hinder parts are covered, and the muzzle alone is visible, with the two claws. Thus it sits, quite still, reminding one of a toad, the broad, triangular pedipalps that fit so close occasionally opening, like the folding doors of a tiny cabinet, and allowing the palpi to be thrust out to wipe the minute eyes. The face, when examined with a lens through the glass walls of the aquarium, has a most funny expression, being singularly like that of an ancient man."

*Planes Linnæana* is the only representative of the family Grapsidæ found on our coasts. A large number of species inhabit the warmer parts of the globe; probably *Linnæana* can only be considered as an accidental visitor. Their natural haunt is amongst the Gulf weed. It is occasionally washed up on the shores of Devonshire and Cornwall. Two specimens in my collection came from that locality.

A rare species, *Gonoplax angulata*, is met with, now and then, at Devon and Cornwall. It resides in excavations formed in the mud, according to Cranch. This crab is a favourite food of some large fish.

The *Pinnotheridæ* live parasitically within the lobes of the mantle of bivalve shells. The ancients believed that they resided with the mollusca, in whose shells they are found, on friendly terms, warning them of dangers, and seeking food for them.

*Pinnotheres pisum* (Fig. 19) is frequently found within the shell of the common edible mussel (*Mytilus edulis*). Mr. W. Thompson, in writing on the Crustaceans of Ireland, says, "The smallest *Pinnotheres* I have seen was found by Mr. Hyndman, in a living *Cardium exiguum*, dredged up by us in Strangford Lough, in October, 1834. It is a male. The carapace is under three lines in length, and barely exceeds that admeasurement in breadth; so that the crab, when in the position just mentioned, must have on both sides touched the walls of his chosen prison." Mr. Ball, when at Youghal, found that about nine out of every ten cockles he opened contained a crab. *P. veterum* is found inhabiting the *Pinna ingens;* it has also been found in the common oyster, and other shell fish.

Pennant gives a quotation from the poet Oppian, which clearly records the ancient belief of the life and manners of the *Pinnotheres:*

> "In clouded deeps below the Pinna hides,
> And through the silent paths obscurely glides:
> A stupid wretch, and void of thoughtful care,
> He forms no bait, nor lays the tempting snare;
> But, dull sluggard, boasts a crab his friend,
> Whose busy eyes the coming prey attend.
> One room contains them, and the partners dwell
> Beneath the convex of one sloping shell;
> Deep in the watery vast the comrades rove,
> And mutual interest binds their mutual love.
> That wiser friend the lucky juncture tells,
> When in the gaping circuit of his shells
> Fish wandering enter; then the bearded guide
> Warns the dull mate, and pricks his tender side.
> He knows the hint, nor at the treatment grieves,
> But hugs the advantage, and the pain forgives;
> His closing shell the Pinna sudden joins,
> And 'twixt the pressing sides the prey confines.
> Thus fed by mutual aid, the friendly pair
> Divide their gains, and all the plunder share."

The *Portunidæ* has more British species than any other family represented on our shores. *Carcinus mænas* is a true running crab, yet all its relations are swimming crabs. Most of them may be found commonly enough on our coasts.

*C. mænas* (Fig. 21) is undoubtedly the most common crab of our shores; no matter whether sandy, stony, or muddy, *mænas* is sure to be somewhere about. It is most voracious, and is often very injurious to the fisherman. Dr. James Howden has seen trout and mackerel reduced to mere skeletons in a very short time, and salmon often rendered unfit for market by this marauder.

*Portumnus variegatus* (Fig. 20) is occasionally met with, and is undoubtedly a most beautiful crab. The carapace is of a dull purplish-white, mottled with a darker hue. Found rarely on the Irish coast. In Scotland it has been taken on the shores of the Firth of Forth and the Moray Firth.

*Portunus arcuatus* seems generally distributed. Professor Bell tells us that "the habits of this species are very similar to those of the rest of the species of the genus. They are active, bold, swimming with agility, and seizing with great sharpness, and pinching severely with their acute claws. They are gregarious, like most of their congeners; and he has found them extremely abundant at Bognor, where they constantly infest the prawn-pots, and, as the fishermen believe, keep the prawns from the bait." He also gives Poole Harbour, and the neighbouring bays of Studland and Swanage, as localities for this crab. I have it from Tenby and the Channel Islands.

*Portunus puber* I find most plentiful on the south-west coast of England; it is also not uncommon on the Irish coast. This species is the largest of the the genus; it is captured in the Channel Islands in "pots" and under rocks at low water, and used for food. The following description is taken from Mr. Gosse's "Aquarium":[1] "An old male of the velvet fiddler is a striking and handsome crab. His body is generally clothed with a short, velvety pile, of a pale brown or drab hue, from beneath which here and there shines out the glossy black shell, especially were rubbed, as at the edges. The feet, particularly the plates of the oars, are conspicuously striped with black; the large and formidable claws are marked with bright scarlet and azure, as are also the foot-jaws and face, while the eyes are of the richest vermilion, projecting from the hollow black sockets." This species, when apprehensive of assault, uses its powerful claws "to strike transversely, as a mower uses his scythe."

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[1] p. 195.

*P. marmoreus* is not uncommon, though perhaps more rarely met with than the last. It has been found at Hastings and at Sandgate. In the month of May, 1844, Professor Bell procured nearly four hundred specimens by two casts of the dredge. Sometimes taken with *P. depurator* in the Channel Islands.

*Polybius Henslowii*, Henslow's swimming crab, the only known species of the genus, exhibits the natatory structure to the greatest extent of any British species. Mr. Couch, in his "Cornish Fauna," tells us that this crab "mounts to the surface over the deepest water in pursuit of its prey, among which are numbered the most active fishes, as the mackerel and the running pollock, the skin of which it pierces with its sharp pincers, keeping its hold until its terrified victim becomes exhausted. We are witnesses of this curious method of obtaining food in the summer only, at which time the fishermen's nets intercept them and their prey together; and it is probable, that in colder weather, they keep to the bottom in deep water, from which however I have never seen them brought in the stomachs of fishes." I have specimens of this species from the south coast.

But few members of the great family *Canceridæ* are known to frequent the British coast. *Xantho rivulosa* is abundant on the Cornish coast, under stones and in crevices, about low-water mark. It has four deep notches on each side of the carapace, near the front; claws well-developed and very strong. Colour, reddish yellow.

*X. florida* (Fig. 23) is a frequent denizen of the coasts of Cornwall, Devon, and Dorset; it is met with occasionally on the Irish coast. This at first sight seems to very greatly resemble the last species, but a ready way of distinguishing between the two rests with the colour of the pincers, which are brown in *rivulosa*, but black in *florida;* of course there are many other distinguishing characteristics.

*Cancer pagurus* will need no clue from me for its identification; the most unproficient of my readers in crab lore may, I imagine, reasonably flatter himself that he knows what the common edible crab is like. The female in Cornwall is called "bon-crab," and the male the "stool-crab." They generally frequent rocky coverts, and hide in the clefts of rocks, where they are sheltered from the waves, and secured from the pursuit of enemies; for even these stony-looking creatures, with their great, formidable claws, have enemies. When the waters rise, they approach the shore and seize on marine animals incapable of resistance, or devour such as have become defunct, no matter how long. They generally pursue their avocation of plunder during the night. I cannot refrain from giving an interesting extract from Mr. Gosse's "Naturalist's Rambles on the Devonshire Coast,"[1] in which he says: "At the water's edge, at the outer base of the Capstone, at low-water spring tide, I was looking about for Actinias, when, peering into a hole, I saw a fine crab, not of the very largest, but still of very nice table dimensions. I poked in my arm and took hold of him; and though he made vigorous efforts to hold fast the angles and notches of his cave with his sharp toes, I pulled him out, and carried him home. I noticed that there came out with him the claw of a crab of a similar size, but quite soft, which I supposed might have been either carried in there by my gentleman to eat, or accidentally washed in. After I had got him out, for it was a male, I looked in, and saw another at the bottom of the hole, which appeared to be considerably smaller. I debated whether I should essay this one also, but reflected that I could only eat one at a supper, and that moderation in luxuries is becoming; 'So,' said I, 'friend Crab, stay there till next time; I may find you here again on some other auspicious morning.' When I arrived at home however, I discovered that I had left my pocket-knife at the mouth of the crab-hole. I felt loath to part with my old knife, and therefore at once put on my hat, running hard, for fear the tide, which had already turned, might be too high. I got to the place however just in time, found my knife, and then took another peep at the crab; it had not moved, and thinking that, if I could not eat it myself, I might ask my neighbour's acceptance of it, I drew it out with my fingers, as I had done the former. But, lo! it was a soft crab, the shell being of the consistency of wet parchment, and the colours (all except those of the carapace) being pale. It was a female too, without any sign of spawn, and had lost one claw; strange, that I had not thought of connecting the soft claw that I had drawn out before with the crab that I saw at the bottom! But I carefully put the helpless creature into the hole again, and saw that it settled its legs and body comfortably in its old quarters, and there I left it; for our crab is worthless for the table in this condition, unlike the land crabs of the West Indies, which are esteemed peculiarly delicate in their soft state. What then are we to infer from this association? Do the common crabs live in pairs? and does one keep guard at the mouth of their cavern while its consort is undergoing its change of skin? If this is the case, it is a pretty trait of cancerine character, and one not unworthy of their acute instinct and sagacity in other respects. The male displayed no appearance of the moult, its coat being of a shelly hardness. I have no doubt that the claw of its mate was unintentionally torn off, in its efforts to grasp some hold, when resisting my tugs in dragging him out." It is not always safe to grope for very large crabs, unless a companion be at hand, for a powerful animal has been known to hold the hand of a person without the power of getting away until a passer by came to his assistance. If it is possible to break one of the claws, that will make the crab let go.

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[1] p. 174.

*Pirimela denticulata* (Fig. 22) is rarely found on the south coast of England, amongst the "fucus." The carapace of this pretty little creature is smooth, strongly marked with several rounded elevations on the anterior half, the front margin on each side, with four or five strong tooth-like projections. The colour is generally greenish or purplish. Length of specimen in my collection six lines; breadth, seven lines. This crab is found in the Channel and the Mediterranean, but is by no means abundant. The family *Parthenopidæ* is feebly represented on our coasts; only one species being found, and that one of the prizes that reward the diligent searcher. It is one of our deep-water crabs, having been dredged in from seventy to eighty fathoms; little is known of its habits. Having some resemblance to a strawberry, this species is often called the strawberry crab; its scientific name is

*Eurynome aspera* (Fig. 24). The carapace and legs are covered with tubercles; colour light rose, with a bluish gray tinge. Length of adult eight to nine lines, and its breadth seven lines. The dredge has secured this crab from Cornwall, Devon, and Dorset. Professor Bell also gives the Sussex coast as a locality.

The remaining two families, *Maiadæ* and *Leptopodiadæ*, consist of spider crabs. The legs are very long and slender: this leads to slowness of motion; but they are well-fitted to a residence amongst the rocks and sea-weeds, amongst which they stride. These animals represent the highest concentrated type of a Crustacean, but by no means the liveliest of the class. In the winter they become torpid, concealing themselves in some sheltered nook, and during this repose seaweeds, sponges, and other marine productions grow upon them, and so completely change their appearance, that they are no longer recognizable.

*Maia squinado* (Fig. 25) is very frequent on almost all parts of our southern and western shores, and is also found on the southern shore of Ireland. It is by far the largest species of the family, and, with the exception of the great crab (*Cancer pagurus*), it is the largest of the British Brachyura. The carapace of a full grown specimen taken in Plymouth Sound measured eight inches in length and nearly six in breadth, whilst the length of the fore limbs was fifteen inches. Like all the triangular crabs, the fishermen inveterately term it "spider," and they appear to have very little idea of any affinity between these forms and the crabs, properly so called. Some years since Professor Bell saw in one of the back streets of Poole, near the water-side, a little girl standing by a small table, on which was a plate containing two of these crabs, of moderate size, cooked and for sale. On being asked by the professor, "Pray, do they eat these crabs here?" she replied, with a look of great surprise at his ignorance, "They ben't crabs, sir; them's *spiders!*"

*Hyas coarctatus* (Fig. 26) is a widely distributed crab; it occurs on most parts of our coasts. Professor Bell gives Youghal, Dalkey Sound near Dublin, the loughs of Strangford and Belfast, and the Giant's Causeway, as Irish localities; abundant off the isles of Arran and Cumbrae in the Firth of Clyde, and at Oban. The carapace is pear-shaped; anterior portion contracted. Colour often bright pink or yellowish rose. Specimens greatly vary in size; sometimes the male is smaller than the female, often *vice versâ*. Length of the carapace of five specimens in my cabinet, about one inch five lines, and breadth, one inch.

*H. araneus* looks very much like the last, only produced on a larger scale. I believe it is more frequently met with than *coarctatus* on most parts of the coasts of England, Scotland, and Ireland. Sandy beaches are favourite spots. Length of carapace of a male, three inches, and breadth two inches; anterior legs four and a half inches long.

*Pisa tetraodon* is rather uncommon. Professor Bell has found it "concealed under the hanging fuci which clothe the rocks at some distance from the shore, in which situation he has taken it amongst the Bognor rocks." Carapace, over an inch in length, nearly the same at its greatest width; colour brown to red. This crab should be looked for under rocks at low water.

The *Leptopodiadæ* are generally obtained by dredging; some may be found at exceptionally low tides.

*Inachus Dorynchus* and *I. Dorsetensis* live amongst the weeds and stones at all depths. An instance is recorded of *Dorsetensis* being dredged at a depth of

140 fathoms, in the Mull of Galloway. Both have been frequently found in the stomach of the cod, of which fish they seem to be favourite morsels. Specimens have been taken at Hastings, Studland Bay, Dorset, Bognor, Weymouth, and Cornwall; at the latter place *Dorsetensis* is said to be commonly taken in the crab pots.

*Stenorynchus rostratus* is perhaps the most common of the spider crabs, being found in large numbers on the coasts of Great Britain and Ireland, from Orkney to Cornwall. Mr. Hailstone states that "it is very common at Hastings, both among the rocks on the shore and in deep water, and is occasionally caught in the trawl-net in vast numbers. Of sixty-eight specimens brought up at once, the proportion of males to females was as two to one." These animals have been described as looking "like overgrown daddy-long-legs going through a course of sea bathing." When taken they move with very little energy, and soon die after leaving the water.

We have now gone through all the families of the Stalk-eyed Crustacea, I must confess in a very unscientific and imperfect way; but it is beyond the object of the foregoing to do more than call the attention of those who have not before studied this most interesting part of God's creation, that they may share with myself and others such a source of intellectual and physical enjoyment.

## Part II. SPIDERS.

THE situations which spiders select for their abode are very various. Some prefer the open air, amid shrubs or plants. Others lodge themselves in corners of rooms, and in places which appear destitute of insects for their support. It would be difficult to say where spiders may not be found. Mr. Jesse has recorded an instance where two spiders formed their webs within a drawer, and continued to occupy the opposite corners of it for *thirteen* years. During the whole time the drawer was used exclusively for soap and candles, and was always kept closed and locked except when opened to put in or take out those articles. The spiders were constantly in the same position, in a hole in the inner corners of their webs, and seldom showed more of themselves than their two forelegs projecting outwards.

Some spiders seem to be able to make themselves at home in almost any place, but many species have a great preference for particular habitats. I find that heath lands and woods are more prolific in spider life than any other *locus naturæ*, both for number of different species and the abundance of specimens.

*Scytodes thoracica*, the only species of its genus found in our country, is by no means common. It inhabits caves, inside of buildings, holes in walls, and is to be met with occasionally under stones. The spider is slow and quiet, only quitting its retreat at the hottest time of the day. Specimens have been captured at Dover.

The *Dysderidæ*, including four genera, live by hunting, running out upon their prey from hiding-places formed under stones, in cracks of walls, and in similar places.

*Oonops pulcher* (fig. 28), a spider about one-thirteenth of an inch in length, is frequently found upon tree-stems. The abdomen is of a bright yellow-red in the adult. Common in Kent.

*Segestria senoculata* conceals itself in a long silken tube, from the mouth of which it stretches out its anterior feet, whose extremities rest upon diverging threads. As soon as an insect walks across any of these threads the spider's toes give it a warning of prey being at hand, when it rushes out and seldom fails to secure its victim.

> "The spider's touch, how exquisitely fine!
> Feels at each thread, and lives along the line."

M. Homberg has seen a vigorous wasp carried off and destroyed by one of these spiders. The abdomen is almost cylindrical, of a dull yellowish brown colour, with a darker pattern running down the middle. The cocoon is formed in May or June. Length of adult about two-fifths of an inch. *Dysdera Hombergii*, and the rest of its genus, are nocturnal in their habits. Remaining motionless throughout the day, at the mouth of its little cell, *D. erythrina* awaits the evening, when it commences to seize all prey that may venture within its reach. It is said to be so fond of ants, that it will construct its silken nest within an ant-hill, thus being surrounded by its prey whilst secure from all assault, enveloped by the close texture and material of its little abode. The abdomen of this interesting spider is of a beautiful cream-colour. Frequently found under stones in the neighbourhood of Manchester, at Cambridge, on the south coast, and also in Ireland.

The family *Epeiridæ* contains some of the most familiar of all spiders. The common garden spider, whose beautiful geometrical nets force themselves upon our attention, and some allied species which inhabit the woods, heaths, and hedgerows, belong to this family. Bloxworth Heath is a very favourable district for the Epeiridæ; in fact, more than 300 species of spiders have been met with in that neighbourhood. The common garden or geometrical spider (see frontispiece) is an excellent example of the spiders. It commences its snare by stretching the outmost or foundation lines, which are attached to several accessible points, so as to first inclose an area. Having completed the foundations, the spider next begins to fill up the outline. Radiating lines are fixed to the boundary lines, and tightly stretched between them, and all joined at the centre of the future snare. In this manner, but without observing regular order in its progress, the spider forms about thirty radii, composed of double lines, passing from the centre to the circumference, and giving the net the appearance of a wheel. The spider then, starting from the centre, proceeds to stretch a series of short threads between the radii, extending thence to the circumference, and gradually widening as the outer boundary is approached. But the most remarkable point is that the whole of these inter-radial pieces of thread, except those forming the centre of the snare, are of a totally different structure from the rest of the net. They consist of a slender thread, closely studded with minute, dew-like globules, which are of a gummy nature, and no doubt give them a greatly increased power of retaining the unfortunate insects which fly into the net. These viscid threads are constantly renewed by the spider. The central part, from which the viscous beads are absent, is frequently used as a station in which the spider lies in wait for its prey, and if disturbed shakes the net so violently that its shape is completely obscured by the rapidity of the vibrations. A retired spot in the vicinity is chosen, in which a silken cell, usually attained by a special line from the centre of the net, is constructed. The spider may be often observed lying in ambush in its little home, the vibrations of the attached thread speedily informing it of the capture of an unwary fly. Should a large, obstreperous insect be ensnared, the spider effectually secures its prisoner by a very ready method. Mr. Blackwall describes the process as follows: "Causing the victim to rotate, by the action of the third pair of legs and the palpi, the first pair of legs also being frequently employed in a similar manner, they extend the spinners laterally, and applying to them alternately the *sustentaculum* of each posterior leg, they seize and draw out numerous fine lines in the form of a fillet, which they attach to their revolving prey, and thus involve it in a dense covering of silk from one extremity to the other. By means of this stratagem," he adds, "they are capable of overcoming formidable and powerful insects, such as wasps, bees, and even large beetles." The cocoon is formed in October, and is of a yellow colour, rather round in shape, and contains a flattened mass of eggs.

*Epeira adianta*, a very beautiful species, has a large oval patch of rich brown, mottled with cream colour, on the upper side of the abdomen. It is not uncommonly found amongst heather. Length, about a quarter of an inch. *E. acalypha* is plentiful in heather, to which it seems exclusively confined. The abdomen is, in the female, greenish yellow, speckled with cream-colour. In the male it has a reddish tinge.

Some species of *Epeira* inhabit the neighbourhood of running streams, and feed upon aquatic insects. It is said that some of the species have been seen floating in the air by means of their threads. The abdomen throughout the family is of large comparative size, rounded or ovate, and very convex, except in

*Tetragnatha extensa*, a rather long, narrow species. Many of them show very fine colours, or an elegant pattern in their arrangement. The typical form of *Epeira* net is easily recognised. The eggs in the cocoons are subject to the attacks of ichneumons and other parasites.

The *Linyphidæ* make a fine sheet of web, stretched horizontally amongst the leaves and branches of trees and bushes. They lie in wait for prey on the under surface of the web, and immediately secure any insect which falls upon it; several intercrossing lines, which serve to keep the snare in position, especially those above the web, check and throw down flying insects that may strike against them.

*Pachygnatha Degeerii* is found in the north of England and Wales, in Cambridgeshire, in Scotland, and in Ireland. It is a very pretty spider, having the upper part of the abdomen of a beautiful olive colour, marked round with an uneven black line. The male differs very much from the female in the markings of the abdomen. Length, one-seventh of an inch. The genus *Walckenaëra* contains a great many species. Most of them are of small size, and generally very dark in colour, without any pattern on the abdomen. *W. ludicra* is glossy, and of a pale dull yellowish colour. It is abundant amongst heather and on furze in May. *W. turgida* and *exilsis* have a faint mottling and spots, being exceptions to the general run of this family. *W. acuminata* may be easily distinguished by the extreme development of the portion of the cephalothorax which bears the eyes. In the female there is a truncated conical tubercle, having four eyes at its apex, and the other four in two pairs a little way down on the sides. In the male the eye-bearing process is of considerable length. This curious little spider may be not unfrequently found under stones in most parts of the country. Length, one-sixth of an inch. It is recorded from Yorkshire, Northamptonshire, and Denbighshire. Some species of the extensive genus *Neriene*, all of which are small, make a fine sheet of web; others reside amongst grass and under stones. Many of them may be found floating in the air, while *N. longipalpus*, a glossy black spider, can live for days in water, if by any accident it should be submerged, and also can float in the air. *N. pygmæa* is glossy, and of a dark brown colour; the abdomen blackish. Common in fields in Lancashire and North Wales. *N. bicolor* is a very common spider, found hiding under stones. The abdomen is hairy, and blackish in colour. Length, one-fifth of an inch.

In the road-side hedges and rank herbage, many of the *Linyphiidæ* may be commonly found. Most of the species are very small, and glossy. *L. crypticolens* is pale yellowish brown, the male darker than the female. The abdomen is rather hairy. A curved black line occurs on the fore part, in the middle of which is a short curved line. There are some oblique streaks on the sides of the hinder part. Length, about one-sixth of an inch. The female is remarkable for the habit of carrying her cocoons attached to her spinnerets by means of threads. Cocoon formed in June or July. The spider is to be met with in dark and damp places, as in cellars and under stones. *L. cauta*, one of the glossy spiders, is nocturnal in its habits, and builds on walls, under banks, etc. Abdomen rather hairy, pale brown, speckled with whitish. *L. montana* is a very common species, weaving its snare in hedges and shrubs. The abdomen is slightly hairy. In the female a dark band, toothed at the edges, runs down the middle. The male has the abdomen very faintly marked, and of a reddish-brown colour. It may be easily recognised by its conspicuous falces, which are long and divergent. This spider is said to be abundant in Scotland and Ireland.

*Pholcus phalangioides* (Fig. 30) is common in houses, where it spins a web of a loose texture in the angles of the walls. The female cements her eggs into a round, naked mass, which she carries between her falces. The body is long and narrow, pale yellowish or livid, and pubescent; abdomen nearly cylindrical, and marked above with blackish spots; very long, slender legs. The members of the genus *Theridion* form snares of very fine threads, crossing each other in all directions, in shrubs and corners of buildings. *T. pallens* occurs on shrubs and bushes, on heaths, or near woods. The female is nearly white. In the male, which is smaller, the shield is yellowish brown; the abdomen blackish above. The spider is minute. Mr. Staveley gives a very interesting account of a specimen that had been brought indoors and placed on a leaf lying on a small square of insect-setting cork, in which two pins had been left standing upright about an inch and a half apart, with a pointed strip of card projecting from one of them. It was carrying its little cocoon, which is larger than the spider. "The little creature," he says, "had drawn three horizontal lines from the head of one pin to that of the other, so forming, as it were, the ridge of the roof-shaped snare of the species. From each pin's head two lines were then drawn obliquely downwards and outwards, and attached respectively to a corner of the cork, the point of the strip of card, the stalk of the leaf, and its leaf. This completed the skeleton, or rather the rafter framework of the edifice, which was then filled up with lines of almost inconceivable fineness, intersecting each other in every direction. The little mother had suspended her cocoon, and when discovered was busily at work elaborating her snare, in entire content at having formed one as perfect and as regular according to the laws of her kind, as if she had had unrestrained choice of place and circumstance." *T. lineatum* is found abundantly amongst the common coarse herbage and shrubs, where it spins its snare. The spider is generally of a pale greenish white. The abdomen is slightly hairy, a fine black branching line runs down the middle. The legs are long and thin. Length, a quarter of an inch. Abounds in Ireland and Scotland. *T. riparium* is a rare species, inhabiting the crumbling ledges of the cliffs at and near Bournemouth. Abdomen slightly hairy, reddish-brown, with black and white markings. The cocoon is formed in August, and is suspended in the snare.

The webs of the *Agelenidæ* are noteworthy on account of their remarkable construction. The snare is often of great extent, very closely woven, and in communication with strong silken tubes, in which the spider lives. They are commonly woven on bushes or at the tips of branches. The spiders are generally rather large, powerful creatures, with the legs and usually the hindmost spinnerets long. *Textrix lycosina* is widely distributed in Great Britain, most commonly occupying crevices in rocks, stone walls, and the bark of old trees. Only one specimen is recorded as having been taken in Ireland. The cocoon is usually concealed underneath a stone, to which it is attached. The abdomen of this species is black above, with a long, pointed, pale patch, on which are two pairs of large black spots, succeeded by some small ones. Length, about three-fourths of an inch. *Cœlotes saxatilis* occurs under stones. The abdomen is yellowish brown, with a dark, broad stripe down the middle. This spider is reported from Wales, Lancashire, and Yorkshire; it is found in May. *Tegenaria domestica* constructs in our houses, in the angles of walls, and in various other situations, a large and nearly horizontal sheet of web, at the most sheltered corner of which is a tube, where the spider remains motionless. The threads of the house spider's web, unlike those of the garden spider, are all of the same kind of silk; and flies are caught in them from their claws becoming entangled in the fine meshes which form the texture. Most persons have remarked the difference between the web of the spider which inhabits the house, and that which seeks its prey in the garden. Having selected some corner for the site of its web, the house spider presses its spinners against one of the walls, and thus glues to it one end of its thread. It then walks along the wall to the opposite side, and there in like manner fastens the other end. As this thread is to form the outward margin of the web, it is strengthened by two or three more threads drawn along it and fixed like the first. From this outer line the spider draws other threads in various directions, the interstices of which it fills up by running from one to the other, and connecting them by new threads until the whole rapidly assumes that gauze-like texture so well known in every house. These webs present merely a simple flat surface; but to those which are found in out-houses, or amongst bushes in the open air, a very ingenious addition may be noticed. Besides the main web, the spider carries up from its edges and surface a number of single threads often to the height of many feet, joining and crossing each other in various places. A small silken apartment below the net is next made, where the spider can wait for game quite out of sight; and that it may know when a fly is caught, a number of threads proceed from the edge of the net to that of its den, which, by their trembling, inform the spider that something is entrapped, and at the same time serve as a bridge, over which it can instantly pass to secure the captured insect. Two species of spiders are included under the name of house spider, *T. domestica* and *T. civilis*, the former rather larger than the latter. There is a great resemblance between the two spiders, but the legs of *T. domestica* are much longer in proportion than those of *T. civilis.*

*Agelena labyrinthica* (Fig. 31), perhaps the commonest spider of the genus, is generally to be found upon heaths and amongst grass, where its large cobwebs form striking objects. From part of the snare a large cylindrical tube runs downwards, at the mouth of which the spider waits, ready to dart on any prey that may become entangled. The colour of the abdomen is brown, with a darker patch running down it, on which there is a pale yellowish line, sending out pale branches on each side. The legs are spinous, hairy, and reddish. Length of female about half an inch. *A. nava* is occasionally found running on the ground, and on railings. This is a spider one-fifteenth of an inch long. The abdomen is dark brown. A hairy little spider, *A. montana*, only a shade larger than *nava*, may be found under stones, and amongst moss.

*The Ciniflonidæ* conceal themselves in foliage, in holes, in corners of walls, and under the bark of trees; and in the neighbourhood of the places of their abode they weave their snares, curled and twisted into a very irregular, open network of extremely fine threads, generally supported upon a stronger foundation line. *Veleda lineata* occurs rather abundantly amongst the heather in the New Forest, that famous hunting ground for the arachnologist. The spider appears in September, and is very small. The abdomen is thickly covered in the front and on the sides near the tip with fine hairs. It is yellowish above, with three dark stripes.

Three or four species of *Ergatis* occur in Great Britain, and generally live upon heather and furze. They spin a white, loose web at the end of long grass or a twig, in which the cocoon is carefully placed, while serving at the same time for the capture of small insects.

*E. benigna* (Fig. 32) is a bold little creature, found in many parts of England, Wales, and Scotland. The abdomen is nearly white above, the sides are dark brown, with white mottling. Length, about one-fifth of an inch. *Ciniflo atrox*, a common spider, has a peculiar habit of suddenly dropping to the ground, when disturbed in its web, without attaching itself by a thread, and feigns death. It has also a remarkable way of moving its fore legs up and down. During the winter months the spider conceals itself in some nook or corner, guarding itself from the cold by a "woollen-like" swathe. The eggs are placed in a white cocoon, which is attached to the inner surface of an oval cell, disfigured on the outside with fragments of dirt. The bite of this small species is said to be more rapid in its poisoning effects than that of other spiders, enabling it to attack wasps and other large insects with success. The abdomen is hairy and dull brown. Legs pale, and tipped with a darker colour. Frequently occurs in Scotland and Ireland.

The *Drassidæ* reside in silken cells, which they build in the crevices of rocks and walls, amongst leaves, and under the loose bark of trees. The spiders are generally of small size, compact form, and are active in their habits. A cell is often formed in a leaf, and has its sides fastened together with silk threads. The most remarkable of all the species is the water spider (*Argyroneta aquatica*, Fig. 33), which passes the greater part of its life beneath the surface of the water; here it pursues its prey and constructs its nest. The spider is about half an inch long, and, contrary to the general rule, the male is larger than the female. The abdomen is covered with fine, downy hairs, which, entangling a quantity of air, and detaining it around the body during its immersion, give to the spider when diving the appearance of a globule of silver. As if not content with this arrangement, which necessitates constant visits to the surface of the water for fresh supplies of air, the spider stores a little reservoir of air in its submerged dome-shaped cell (Fig. 34), in which it can then rest for a considerable period. The cell is very similar in construction to those made by the other *Drassidæ* on land. It is attached by silken threads to neighbouring objects in the water, such as stalks and leaves of plants. Here it lies in wait for its prey, deposits its cocoons, which it carefully watches, and incloses itself to pass the winter. Occasionally the spider comes on shore and huntsterrestrial prey, which it carries into its cell under the water, to be kept until wanted. It is found in many parts of England, in pools and ditches. It is said to be very abundant in the neighbourhood of Lurgan in Ireland.

*Clubiona erratica* will be found frequently in its nest amongst the branches of furze or other plants, and may be known by its olive-green abdomen and reddish brown shield. The legs are pale yellowish brown. *C. holosericea* occurs commonly in woody districts, and may be found on the leaves and flowers of plants, under stones, and in many other situations. The cocoon is placed in a long tube-shaped cell, in which the female remains, except when she leaves it to seize some passing insect. This spider is said to be very timid until she becomes a mother, when she will face any danger rather than abandon her offspring. Abdomen covered with short gray hairs; the legs hairy, and reddish brown. Length of spider about half an inch.

*Drassus lapidicolens* lives under stones, or in the fissures of walls, where it constructs a cell; near the cell it spins some threads, forming an irregular snare. The mother remains in the cell with her young for some time after they are hatched. The abdomen of this creature is grayish brown, with a faint but darker streak running about half way down its upper side. Legs light brown. Length, half an inch. *D. lucifugus* is about the same size as the last, and has an entirely black abdomen. This species should be carefully looked for, it being one of our rare species. Taken in Dorset under stones. *D. ater* is nocturnal in its habits. The female makes a large white cell of close texture, usually in a hole in the earth or under a stone; in this she places her cocoon. The spider is about one-third of an inch in length, and nearly black. *D. nitens*, a black and bright metallic-looking little spider, may be frequently seen running on the ground in spring and summer.

The *Thomisidæ*, designated by the name of crab spiders, usually conceal themselves amongst herbage, but often in cracks and crevices of trees, rocks, and walls. The legs are so jointed as to spread out straight from the body, the first two pairs of which are greatly developed, enabling the spiders to move sideways, forwards, and backwards, like crabs. They also adopt the crab-like device of feigning death to elude danger. These characters are less conspicuous in *Sparassus* than in the other genera.

*S. smaragdulus* is one of the most beautiful of our

British spiders. The female is entirely of a fine green colour. The young male resembles the female in colour, but when full grown the abdomen is banded longitudinally with yellow and crimson. The female ties three or four leaves in a triangular bundle, lines the interior with a thick layer of silk, and places its cocoon in the middle. Not uncommon in woods in the south of England.

*Philodromus fallax*, remarkable not only for being rare and local, but for its exceeding similarity in colour to the yellowish sand of sand-hills where it occurs, is to be taken in the neighbourhood of Bournemouth. *P. elegans*, an exclusively heath spider, may be also met with in the same locality. It is of a pale brown colour, with darker reddish brown markings. *P. dispar* occurs in most wooded districts of England and Wales. This is another yellowish brown spider, but may be distinguished by some gray markings on its abdomen. The legs are speckled with black, and the two first pairs especially long in the male.

*Thomisus cristatus* is a very common spider, frequently to be observed on the ground, but remarkable as an aëronaut, especially when young. Mr. White, in speaking of these spiders, says: "Every day in fine weather in autumn do I see these spiders shooting out their webs, and mounting aloft: they will go off from the finger if you take them in your hand. Last summer one alighted on my book as I was reading in the parlour; and running to the top of the page, and shooting out a web, took its departure from thence. But what I most wondered at was, that it went off with considerable velocity in a place where no air was stirring; and I am sure that I did not assist it with my breath. So that these little crawlers seem to have while mounting some locomotive power without the use of wings, and move faster than the air in the air itself." The spider is pale brown, with scattered hairs; feet with small spines; a traverse yellowish stripe on the front; abdomen rounded, and a yellowish band on the middle of the back, deeply scalloped at the edges. Length, a quarter of an inch. Another species, *T. brevipes*, of a pale brown colour, and short legs, frequently occurs under stones. This spider is smaller than the last.

The *Salticidæ* are neat and active little spiders, of small or moderate size. They prepare no snares for the capture of flies, but wander about in quest of their prey, often capturing it by means of a sudden jump. The name of the family has been given them on account of their habit of jumping, which they will do on the slightest apprehension of danger. To this division belongs a very pretty, small-banded species, *Salticus scenicus* (Fig. 36), which in summer may be seen running on every wall. It moves in short leaps, and stops suddenly at intervals, raising itself up upon its legs, as if to survey the neighbourhood. When it discovers a fly, or especially a gnat, it advances along carefully until within leaping distance, when it darts upon it; the whole behaviour of the creature reminding one of the conduct of a cat after a mouse. The spider is black and brownish, with white zebra markings. Cocoons formed in June. Length of spider, a quarter of an inch. *S. formicarius* is very rare in Britain, but occurs in Scotland more frequently. The spider, like many of the genus, constructs, amongst leaves, under stones, etc., a silken nest, oval, and open at each end; into which it retires in order to take rest, to moult, or to take refuge from danger. This species so closely resembles an ant, that it might be easily mistaken for one.

*Eresus cinnabarinus* is exceedingly rare, and only met with, I believe, in the neighbourhood of the New

Forest. A single specimen was captured at Bournemouth, by Dr. Sharp, in 1874. The abdomen of the spider is bright red or crimson above, with large black spots, edged with white hairs. Length, about one-third of an inch. Spins on bushes.

The *Lycosidæ*, or wolf spiders, are wandering predaceous spiders, but they run down their prey without springing upon it like the *Salticidæ*. They are extremely voracious, and courageously defend their dwelling. A foreign species of this family, the *Tarentula*, so called from Tarentum, a city of Italy, in the environs of which it is common, is highly celebrated. The poisonous nature of its bite is thought to produce the most serious consequences, being frequently followed by death or *tarentism*, results which can only be avoided by the aid of music and dancing. Although the bite of this creature may give rise to disagreeable symptoms, we can attach little credence to the fabled tales told by old writers about the spider. The British species are of medium size. They generally keep on the ground, where they run with great swiftness, and go in pursuit of the insects, which constitute their food, at night. They inhabit holes accidentally presented to them, or which they excavate, lining the walls with silk. Some may be found under moss, fallen leaves, and stones. The females show a most affectionate care for their offspring, and carry their cocoons with them when they go out to hunt.

*Hecaërge spinimana* occurs in woods in many parts of Great Britain. The spider is pale brown and hairy. The legs have strong spines, are marked with streaks above, and are spotted. Length, about a quarter of an inch. *Dolomedes fimbriatus*, a large and handsome species, attaining a length of five-sixths of an inch, abounds in the fen country. It may be frequently seen running on the surface of the water with the most surprising rapidity, capturing insects that may come in its way. The spider is hairy, and dark brown, striped with yellow. Cocoon is round, of a brown colour, and the female carries it under her body. *D. mirabilis* (Fig. 37) is found in well-wooded districts. It hunts for its prey, running very rapidly upon the ground, and springing upon an insect that may venture too near. Colour brown. On the abdomen are faint markings down the middle, and a pale, waving line between two darker lines. Length, half an inch. *Lycosa piratica* pursues its prey on the surface of the water, often diving to escape danger. Occurs commonly in marshy districts at the edges of pools. The spider is of a yellowish brown colour. Length, one-third of an inch. *L. fluviatilis* may be found on the banks of rivers. The abdomen is hairy, and has three small tufts of hair on the fore-part, in front of which is a black spot.

The family *Mygalidæ* has only one representative in England. Amongst the foreign species are found the largest spiders known. Several of the species exceed two inches and a half in length, and their legs cover a space of five or six inches. It is said that they will sometimes seize upon humming birds. A large number of species of smaller size excavate for themselves subterranean caverns, wherein they live, secure from detection. The entrance to this excavation is carefully guarded by a lid or door, which moves upon a hinge, accurately fitting into the mouth of the burrow.

*Atypus sulzeri*, the British species, forms a cylindrical gallery in moist ground, the direction of which is horizontal at first, and then inclined; it lines the inside of the tube with white silk. The spider, which is glossy, has a brown and slightly hairy abdomen, and may be at once distinguished from all other British spiders by the great size of the cephalothorax and falces. The cocoon is fastened with silk to the bottom of the gallery. This species feigns death when taken. Abundant at Hastings.

With these few notes, let the student go forth in his leisure hours and observe the habits and abodes of these creatures for himself; he will discover much that he will not find in this book, and I feel confident will not regret that his attention has been called to the study of the much depreciated spiders.

# CHAPTER IV.

## *CLASSIFICATION.*

## Part I. CRUSTACEA.

The shrimps, lobsters, and crabs are divided into two orders, and represent the highest forms of the class Crustacea. They form a division of a sub-class, remarkable for having their eyes pedunculated, that is, supported upon movable stalks. The first order constitutes the Stomatopoda, or *mouth-footed*, and the remaining one, the Decapoda, or *ten-footed*, Crustaceans.

The order Stomatopoda is divided into families, the families into genera, and the genera into species.

The Decapods form three tribes, known by the names of Macroura, Anomoura, and Brachyura, which, when translated into plain English, mean *Big-tails*, *Queer-tails*, and *Little-tails*. These tribes are then split up into families, genera, and species.

### Order I.—Stomatopoda.

This order consists solely of shrimps. They are all marine, and but little is known of their habits. There are seven, and in some cases eight, pairs of legs placed in the vicinity of the mouth, hence the name of the order. Respiration is purely aquatic. The branchiæ are always external.

### *Fam.* 1. *Squillidæ.*

Outer antennæ inserted on each side of antennary segment, having an oval scale-like process at the base, and furnished with a short terminal filament; inner antennæ attached to the anterior margin of antennary segment, and terminated by three filaments. First pair of thoracic legs very large and adapted for seizing prey; the last joint strongly armed, and folding upon preceding joint. The next three pairs of legs are small, and terminate in a rounded hand, armed with a movable finger; the last three pairs, slender and cylindrical. Carapace divided into three portions. Abdomen long, depressed, and furnished with natatory organs. The tail is the principal organ of locomotion.

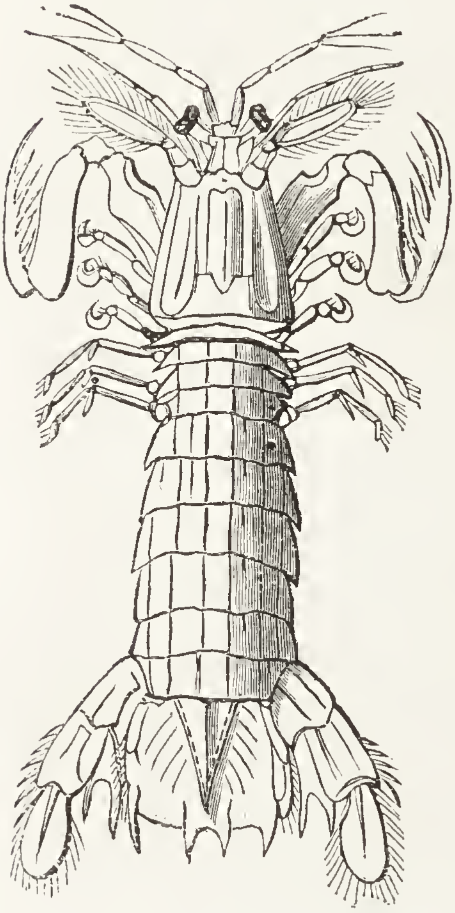

FIG. 10. *Squilla mantis.*
Length, four or five inches.

The family contains but a single genus, having two species, *Squilla mantis* and *Desmarestii.*

### *Fam.* 2. *Mysididæ.*

Outer antennæ give attachment to a scale-like process; inner antennæ have two terminal filaments in the genera *Cynthilia* and *Mysis;* terminal filament shorter and slender in remaining genus. All legs of same form and adapted for swimming. Carapace with sides folded under at base of the legs. Abdomen slender, and cylindrical.

Contains the genera *Cynthilia*, *Themisto*, and *Mysis*.

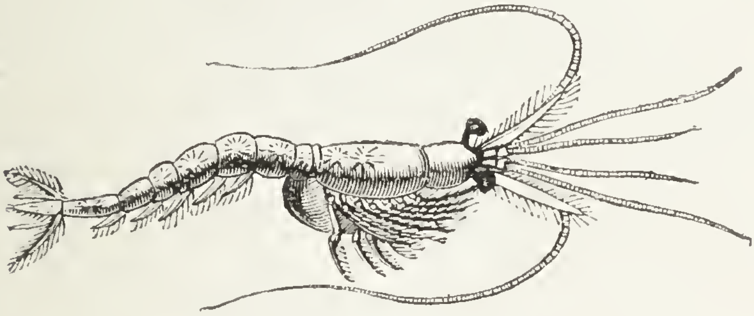

FIG. 11. *Mysis chamæleon.* Length, about an inch.

## Order 2.—Decapoda.

The members of this order comprise the well-known crabs, lobsters, and shrimps. With the exception of the crayfish (*Astacus fluviatilis*) they are all marine.

The legs are typically ten in number, as the name of the order implies, but we find an exception to this in the first family, some of the species having six or even eight pairs of legs. The thoracic segments are united with those of the head into a single mass; here again the *Diastylidæ* excepted. Some of the Decapods are essentially organized for swimming, and wander in the wide ocean; others remain near the coast, but never leave the water; some spend as much time out of the water as in it.

### TRIBE I. *MACROURA* (BIG-TAILS).

The lobster may be taken as a well-marked example of this tribe. The abdomen is furnished with a large swimming tail, formed of five plates arranged like a fan.

### *Fam.* 1. *Diastylidæ.*

Outer antennæ very minute, and armed with minute hairs; inner antennæ longer, articulated and terminated by slender spines. Legs very small, and classed as simple and compound. The former are used for swimming, the latter for seizing prey. Carapace prolonged into a beak. Abdomen moniliform, long and seven-jointed. The largest species of this family rarely exceed half an inch in length.

Including the genera *Bodotria*, *Alauna*, and *Cuma.*

### *Fam.* 2. *Penæadæ.*

Outer antennæ underneath the inner; inner antennæ slender, and terminated by two filaments; both pairs are generally very long. Two first pairs of legs rather stout, two-toed, and of about equal length; the three following pairs of legs very slender, one-toed; the fourth pair is the shortest. Carapace very long. Abdomen long, compressed, and soft.

This family comprises the genera *Penæus* and *Pasiphæa.* Length, three inches.

### *Fam.* 3. *Palæmonidæ.*

Outer antennæ very long in all but the genus *Hippolyte;* inner antennæ ending in two or three many-jointed filaments. Legs rather stout, and without basal appendages. First and second pairs of legs generally two-toed. The last three pairs simple. Carapace broad, and furnished with a long rostrum. Abdomen rounded above and bent downwards at the third joint.

Embraces the genera *Palæmon*, *Pandalus*, and *Hippolyte.*

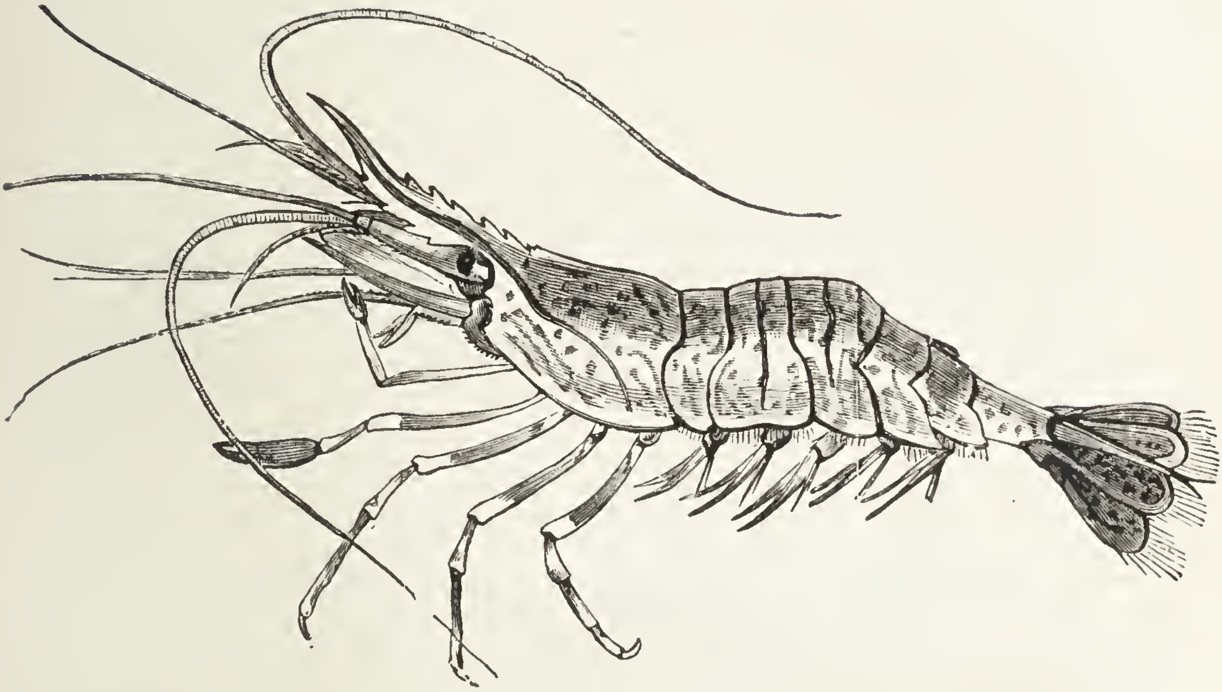

FIG. 12. The common prawn. *Palæmon Serratus.*

### *Fam.* 4. *Alpheadæ.*

Antennæ inserted in two rows, the inner above the outer. Outer antennæ long and slender; inner antennæ terminating in two or three filaments. First pair of legs very robust and two-clawed; second pair also two-clawed, but slender. The remaining pairs always slender and simple. Carapace elongate; overhanging the eyes in the genus *Alpheus.* Rostrum small or wanting. Abdomen long, rounded above, and bent.

This contains the genera *Athanas*, *Nika*, and *Alpheus.*

### *Fam.* 5. *Crangonidæ.*

Both pairs of antennæ on the same line. Outer antennæ long and slender; inner antennæ short, having a broad scale at the base; terminating in two filaments. Anterior claws strong and large, having a flattened hand, on the front edge of which folds down a hooked finger, meeting a tooth-like, immovable spur. The second pair of legs very slender, and ending in in two small claws. The third pair is slender; the remaining pairs shorter and stouter. Carapace very depressed. Abdomen very large, rounded and bent downwards at the third joint.

Comprising the single genus *Crangon*, to which belongs the common shrimp (*Crangon vulgaris*), Fig. 13.

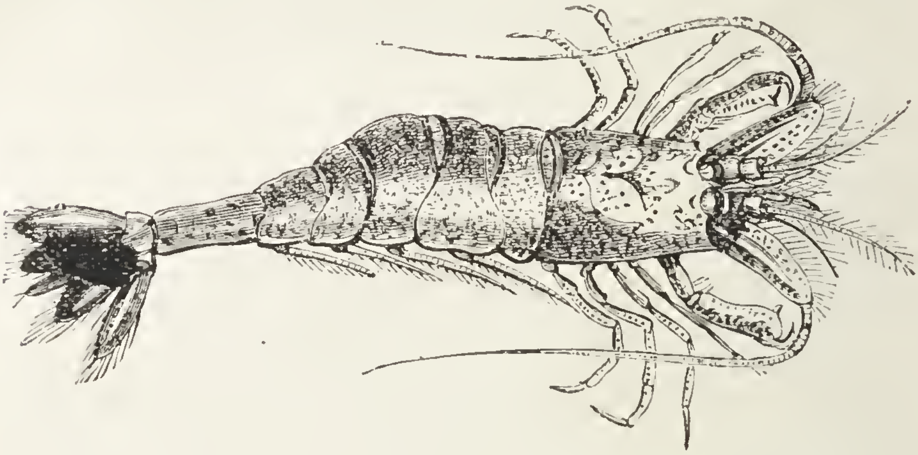

FIG. 13. The Common Brown Shrimp (*Crangon vulgaris*).

### *Fam. 6. Astacidæ.*

Outer antennæ with a movable scale at the base; usually very long; inner antennæ short, and branching off into two filaments. First pair of legs very large and two-clawed: second and third pairs slender and two-clawed; fourth and fifth pairs simple. Carapace compact and terminating with a rostrum. Abdomen of equal width throughout. Tail very large and broad.

The crayfish and the common lobster belong to this family. Includes the genera *Nephrops*, *Homarus*, and *Astacus*.

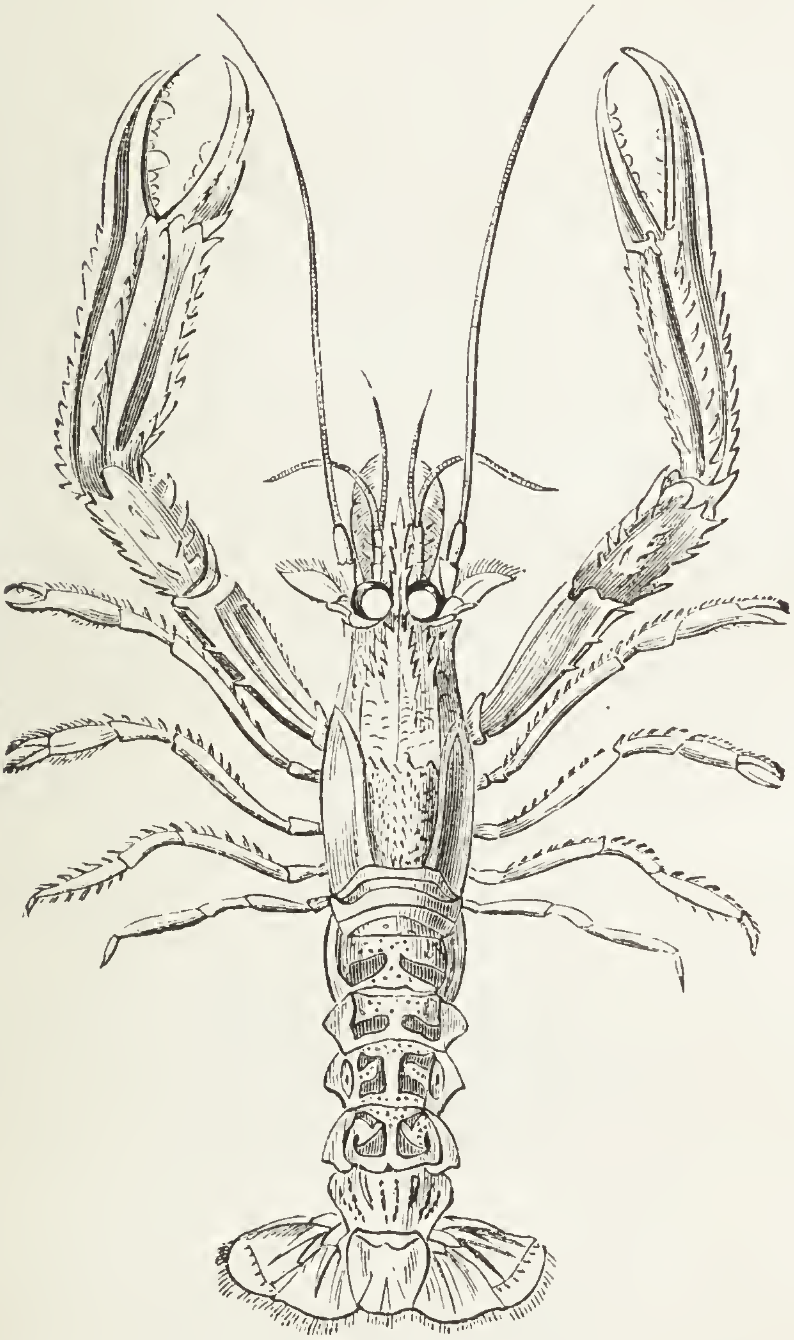

FIG. 14. The Norway Lobster (*Nephrops Norvegicus*).

### *Fam.* 7. *Thalassinadæ.*

Antennæ in the same line. Outer antennæ generally long; inner antennæ short, with two setæ. Legs stout. First pair unequal and two-clawed, the right one being generally much larger than the left. In the genera *Callianassa*, *Axius*, and *Calocaris*, the second pair small and didactyle. Claws very long in the genus *Calocaris*. The third pair of legs very wide and hairy at the end, in the genus *Callianassa*. Carapace generally terminated by a rostrum. Abdomen long and somewhat depressed.

A family comprising *Calocaris*, *Axius*, *Gebia*, and *Callianassa*.

### *Fam.* 8. *Palinuridæ.*

Outer antennæ very thick and long; basal joint large; inner antennæ long, and terminated by two short, many-jointed setæ. Legs simple. Carapace spiny, with two horn-like spines projecting over the eyes. Abdomen thick and long. Tail broad.

Containing but one native species.

### *Fam.* 9. *Scyllaridæ.*

Outer antennæ very peculiar, being short and leaf-like; inner antennæ short, and terminated by two short setæ. All the legs one-clawed. Carapace almost square from above and rather spiny. Abdomen wide. Tail very broad, with soft and flexible plates.

Includes the single genus *Scyllarus* and one British species. It is about three and a half inches long.

## TRIBE II. *ANOMOURA* (QUEER-TAILS).

This tribe connects the long and short-tailed families. The species have limbs of a very anomalous conformation. In the families Homoladæ and Dromiadæ

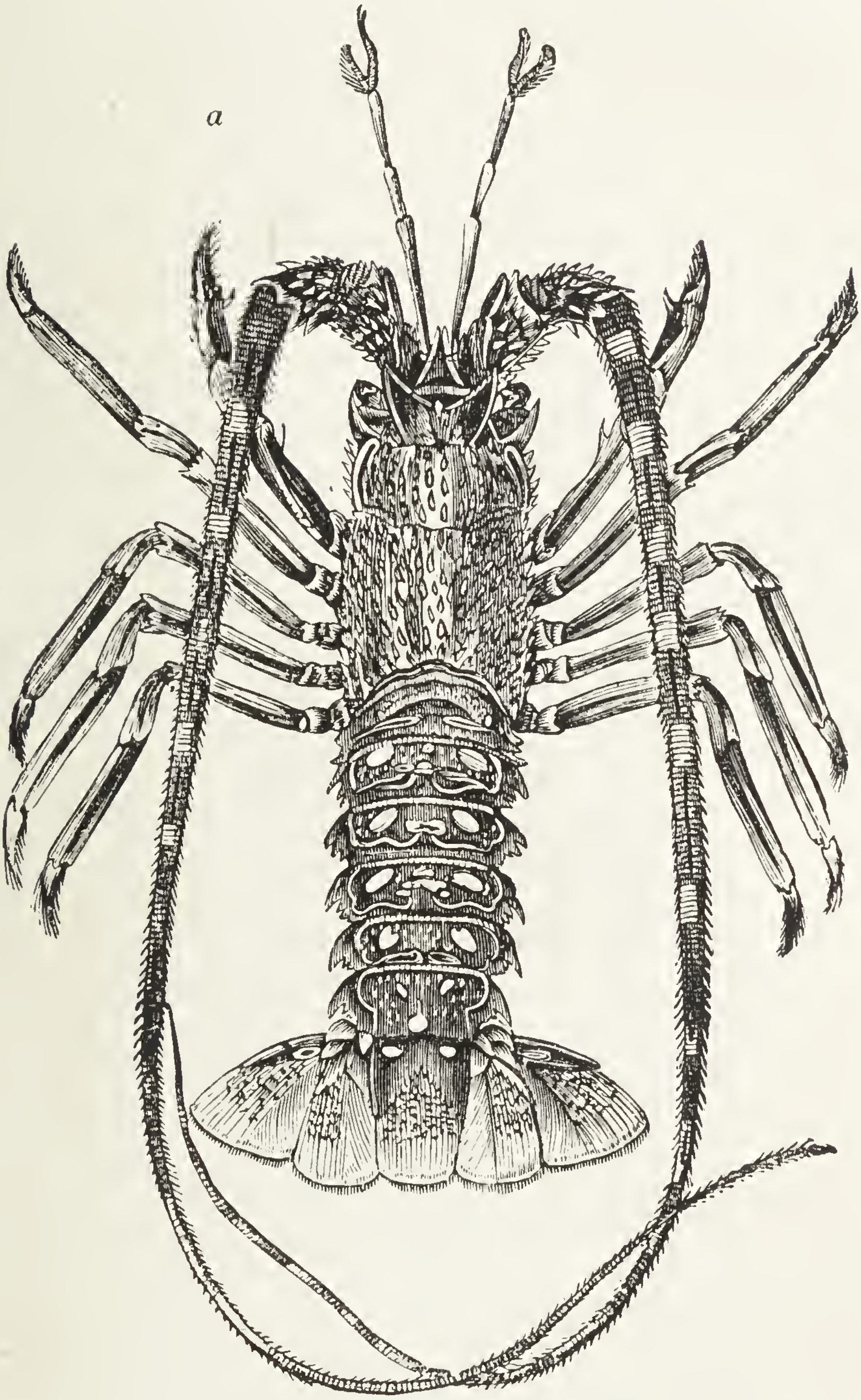

FIG. 15. *Palinurus vulgaris.*

the abdomen has no terminal appendages; in the Paguridæ, containing the hermit crabs, that part is furnished with a pair of movable appendages.

### *Fam.* 1. *Porcellanidæ.*

Outer antennæ long; inner antennæ short. First pair of feet very long and two-clawed; second, third, and fourth pairs simple; fifth pair very slender and spurious. Carapace depressed and rather wide; longer than broad; ending in a rostrum in the genera *Munida* and *Galathea.* Abdomen short and rather broad; folded under the carapace in the genus *Porcellana.*

Comprising *Munida*, *Galathea*, and *Porcellana.*

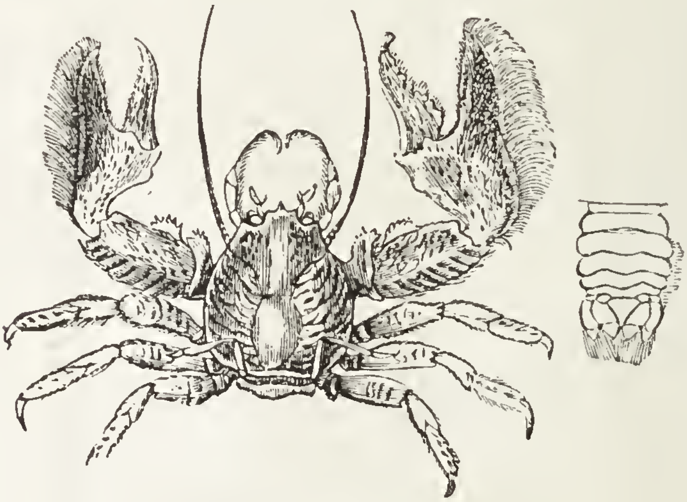

FIG. 16. *Porcellana platycheles.*

### *Fam.* 2. *Paguridæ.*

Outer antennæ long, and furnished with a movable spine; inner antennæ short, slender, and furnished with two terminal setæ. First pair of feet very unequal, the right hand being generally larger than the left; second and third pairs simple; fourth and fifth pairs small, abortive, and two-fingered. Carapace small and only covering the front portion of the thorax. Abdomen long, rather slender and membranous. Tail crustaceous.

In order to protect their soft bodies, the members of this family inhabit univalve shells.

Contains the single genus *Pagurus*.

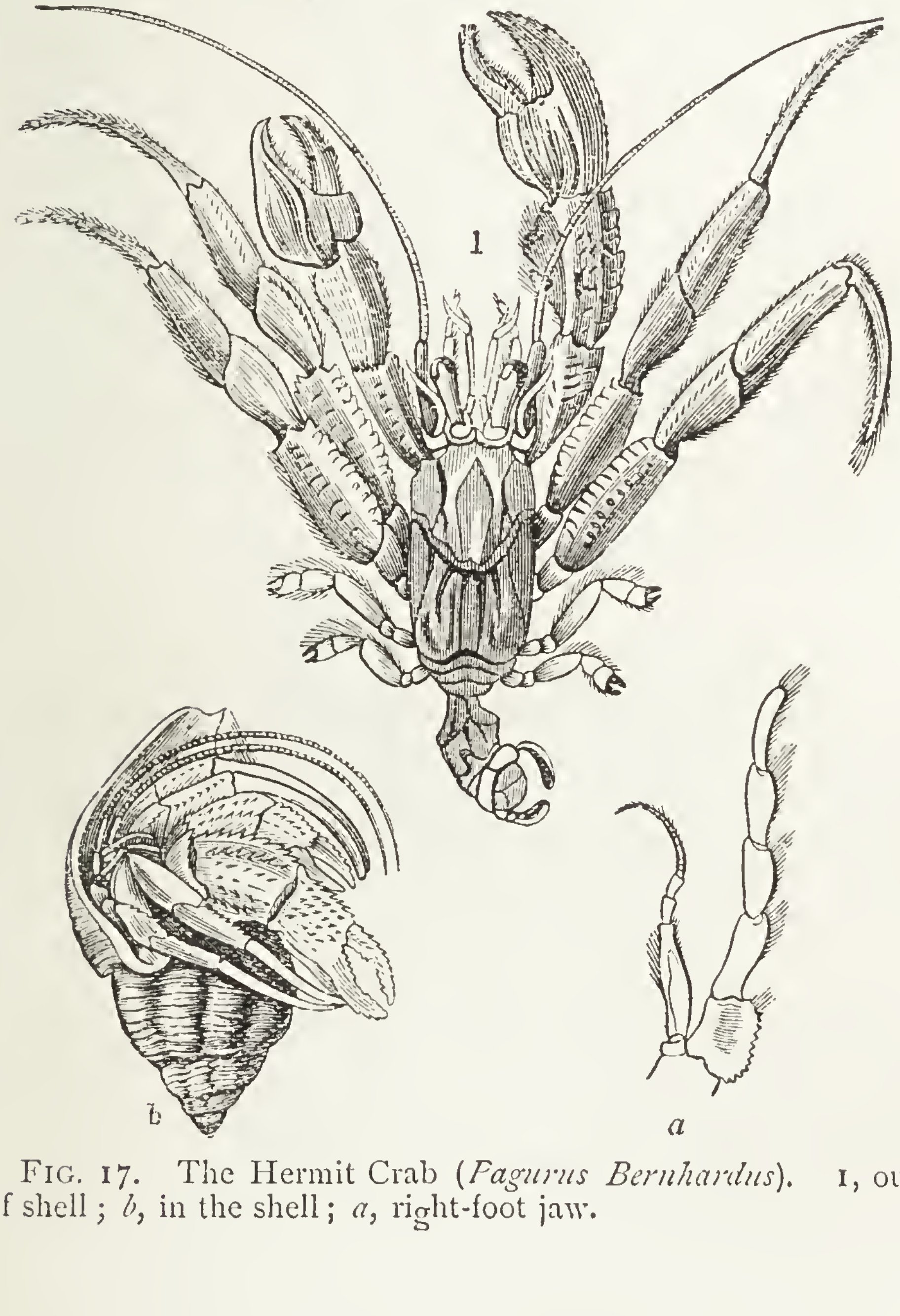

FIG. 17. The Hermit Crab (*Pagurus Bernhardus*). 1, out of shell; *b*, in the shell; *a*, right-foot jaw.

### *Fam.* 3. *Homoladæ.*

Outer antennæ short; inner antennæ terminating in two setæ. First pair of legs rather large, the claws well-formed; the second, third, and fourth pairs simple; the fifth pair very short, and folded backwards beneath the carapace. Carapace very hard, spiny, and ending in a rostrum. Abdomen large, and bent under the body. Length of carapace five inches; breadth, four inches.

Includes but one genus, *Lithodes.*

### *Fam.* 4. *Dromiadæ.*

Outer antennæ short; inner antennæ very short. First pair of legs large, and ending in strong claws; second and third pairs simple; fourth and fifth pairs small and two-clawed. Carapace thickly covered with short hairs and rather globular. Abdomen broad and curved under. Length of carapace two and a half inches; breadth, three inches.

Contains one genus, *Dromia.*

## TRIBE III. *BRACHYURA* (LITTLE-TAILS).

In the members of this division the abdomen is very slightly developed, and not employed to assist the animal in swimming; it is turned under the body, and the fin at the extremity entirely obliterated. The legs are the principal locomotive agents.

### *Fam.* 1. *Corystidæ.*

Outer antennæ large; inner antennæ small. First pair of legs generally robust and two-clawed, very long in the male of *Corystes;* remaining legs simple. Carapace nearly circular and very smooth.

Embraces the genera *Corystes*, *Atelecyclus*, and *Thia.*

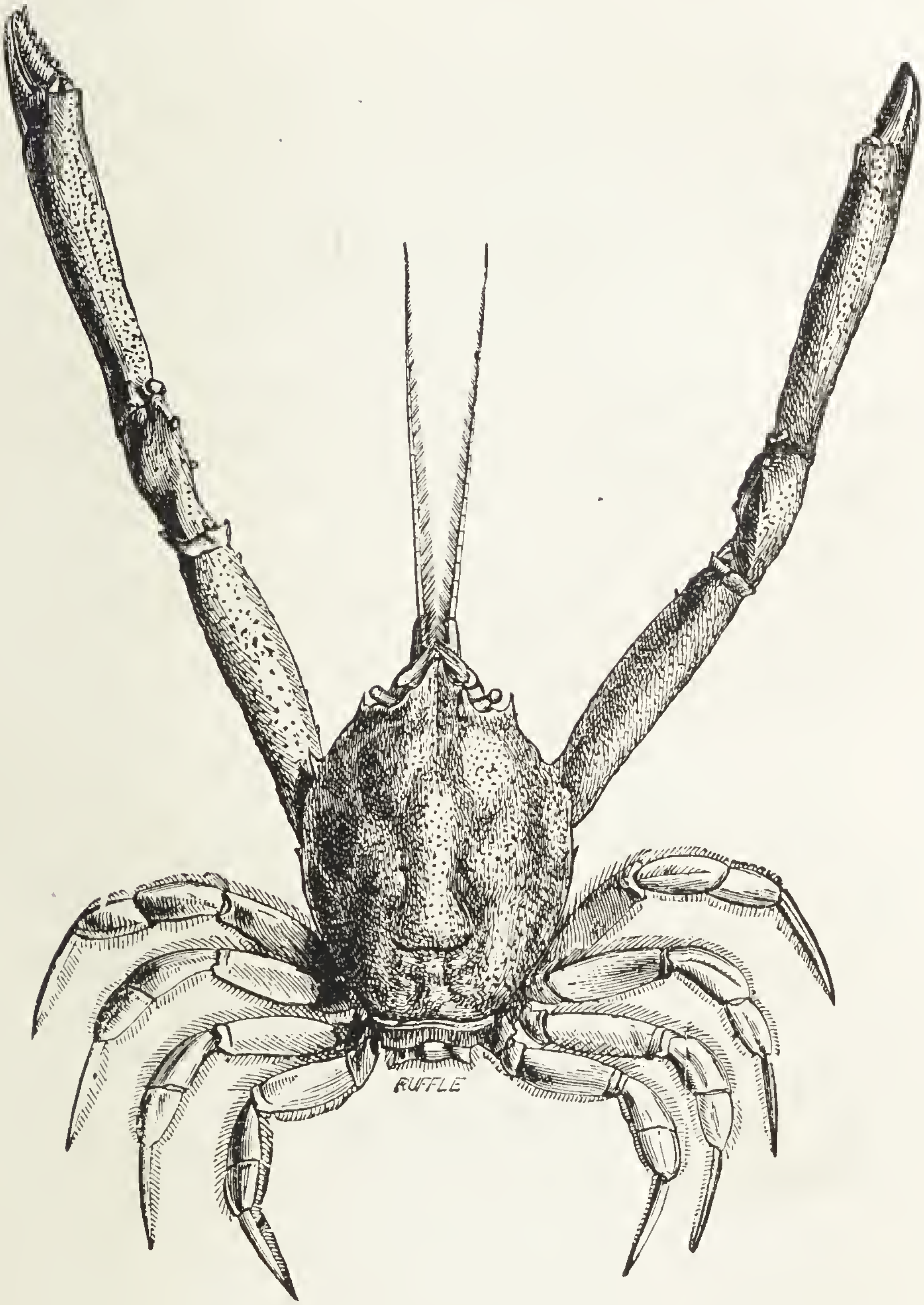

FIG. 18. *Corystes Cassivelaunus* (male).

### *Fam.* 2. *Leucosiadæ.*

Both pairs of antennæ extremely minute. Anterior legs robust and well-formed; two-clawed. The remaining pairs short and simple. Carapace circular, angles rounded.

The species belonging to our seas are small in size and number, and belong to the single genus *Ebalia.*

### *Fam.* 3. *Grapsidæ.*

Outer antennæ very small; inner antennæ small, thickened, and hairy. Front pair of legs thick, and armed with slightly toothed claws; remaining pairs flattened, ending in simple fingers. Carapace almost square.

Only one species is found on our coasts (that but rarely), its natural habitat being amongst the Gulf-weed (*Sargassum natans*).

Contains the genus *Planes.*

### *Fam.* 4. *Gonoplacidæ.*

Outer antennæ long and slender; inner antennæ small. First pair of legs very long, and claws very large and toothed; remaining pairs simple. Carapace square. Eye-stalks remarkable for their great length.

Containing but one British representative, *Gonoplax angulata.*

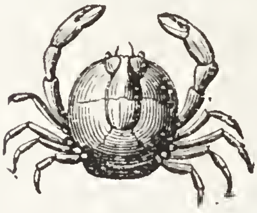

FIG. 19. The Common Pea-Crab (*Pinnotheres pisum*).

### *Fam.* 5. *Pinnotheridæ.*

Both pairs of antennæ very minute. Front pair of legs thick, and armed with two well-formed claws; four remaining pairs slender, terminating in a hooked finger. Carapace circular, soft, and smooth.

The species of this family are of

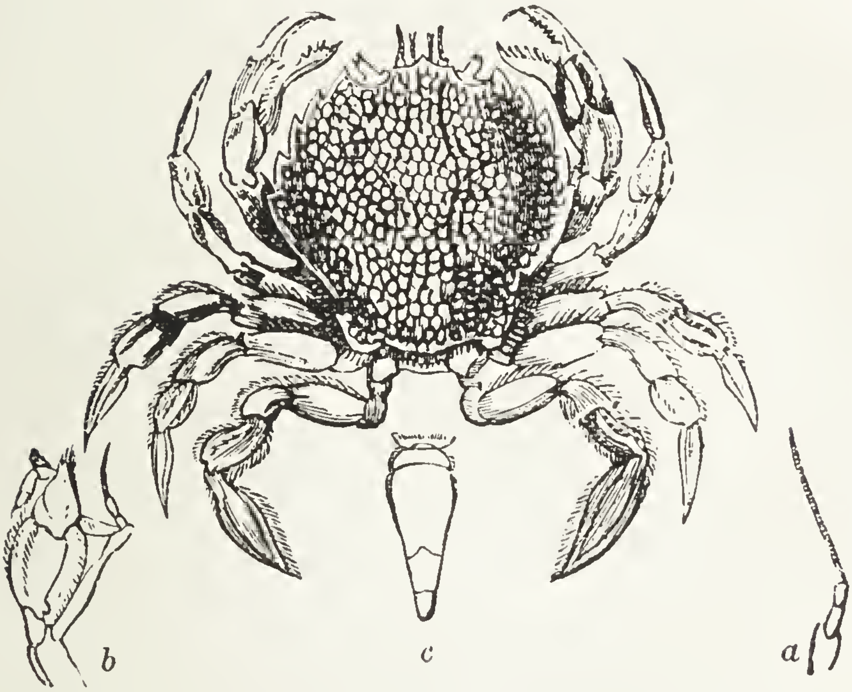

FIG. 20. *Portumnus variegatus.*

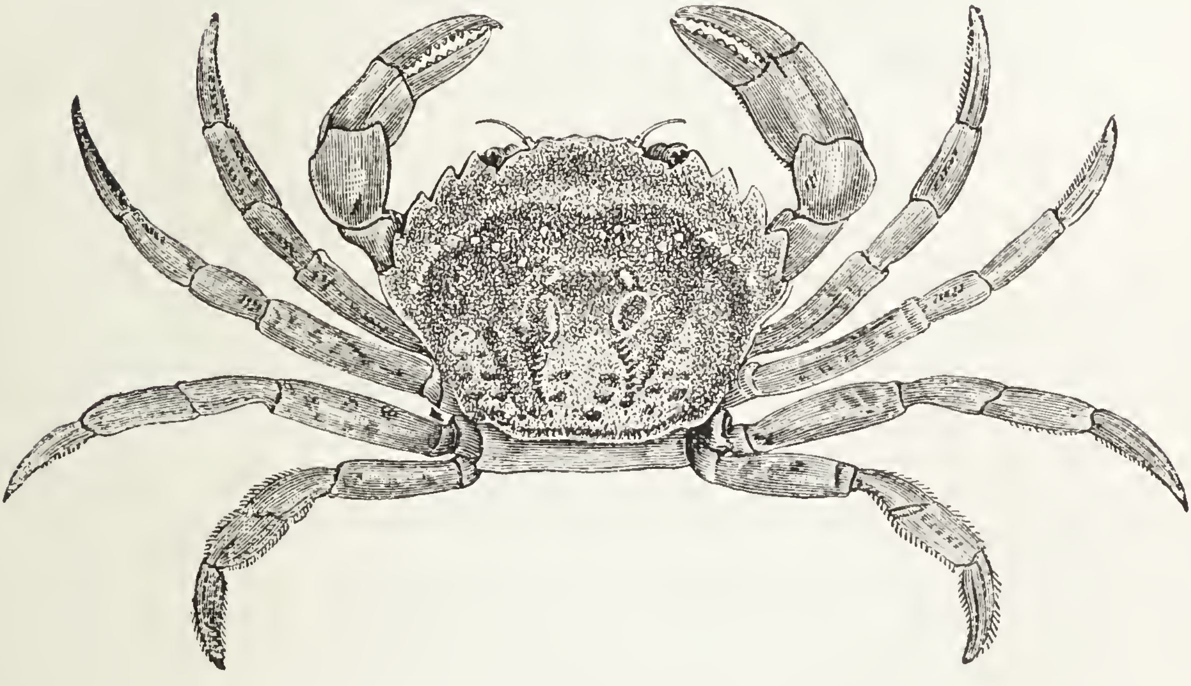

FIG. 21. The Common Shore Crab (*Carcinus Mænas*).

small size, and make their habitation within the valves of living bivalve shells.

Contains the genus *Pinnotheres*.

### *Fam.* 6. *Portunidæ.*

Outer antennæ short; inner antennæ smaller and lying in cells. Front pair of legs often unequal; pincers well-developed; the second, third, and fourth pairs compressed, with the last joint simple; fifth pair formed for swimming, the two last joints being flattened, and last joint resembling a fin. Carapace generally rather broader than long, with the front edge toothed.

To this family belong *Polybius*, *Portunus*, *Portumnus*, and *Carcinus*.

### *Fam.* 7. *Canceridæ.*

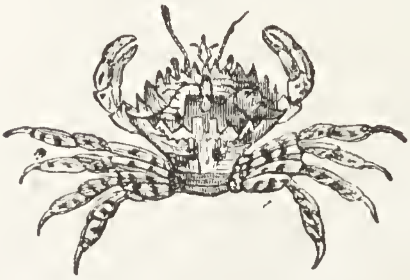

FIG. 22. *Pirimela denticulata.*

Outer antennæ short, as in the preceding; inner antennæ very small. First pair of legs well formed and thick. Pincers large and strong. The other legs are not formed for swimming, but end in a pointed toe. Carapace wider than long; front edge toothed.

This is an important family, containing the common edible crab.

Includes the genera *Pirimela*, *Pilumnus*, *Cancer*, and *Xantho*.

### *Fam.* 8. *Parthenopidæ.*

Outer antennæ short but prominent; inner antennæ minute. Front pair of legs long in the male; tuberculated and spiny; the remaining legs are short, wrinkled, and ending in a simple finger. Carapace covered with tubercles arranged with some regularity; ending in a two-horned beak.

Containing but a solitary British genus, *Eurynome*.

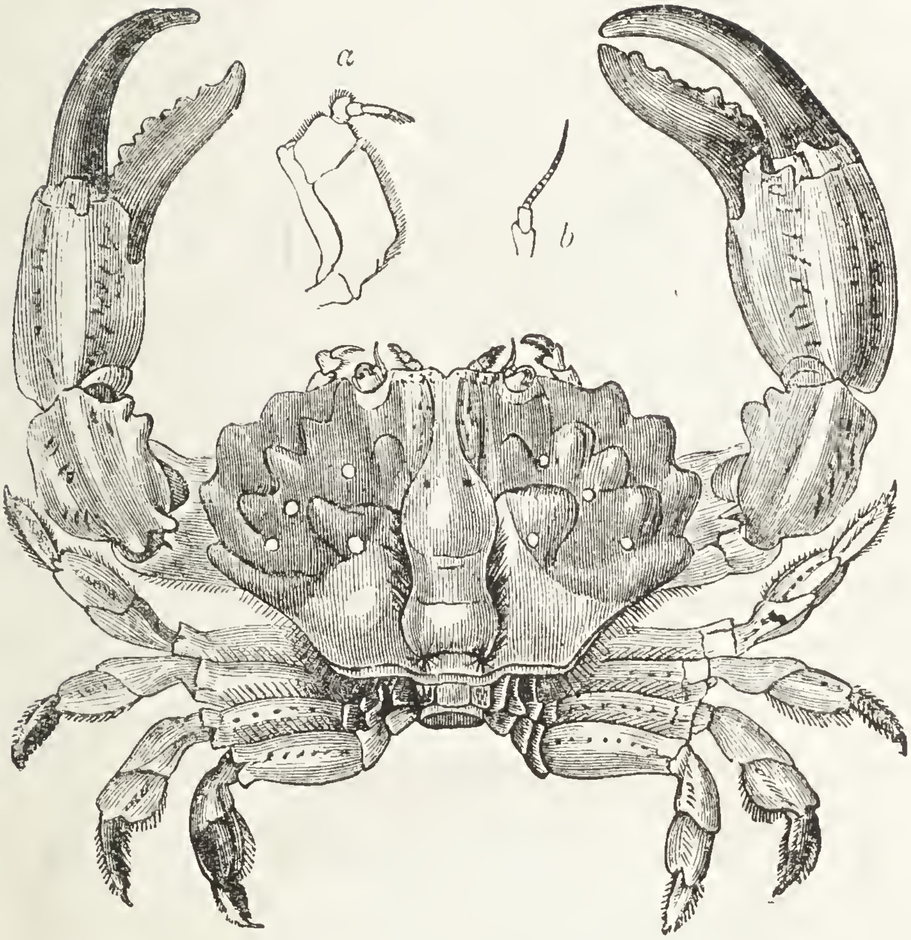

FIG. 23. *Xantho florida.*

### *Fam.* 9. *Maiadæ.*

Outer antennæ short; basal joint large. Inner antennæ lodged in a cavity or depression. Front pair of legs thick, and generally about the same length as the others. Pincers tapering and slightly toothed. The four hind pairs of legs rather slender; terminal joint simple. Carapace pear-shaped, spiny, and tuberculous, or covered with dense hairs. Rostrum divided into two horns.

This comprises the genera *Maia*, *Hyas*, and *Pisa*.

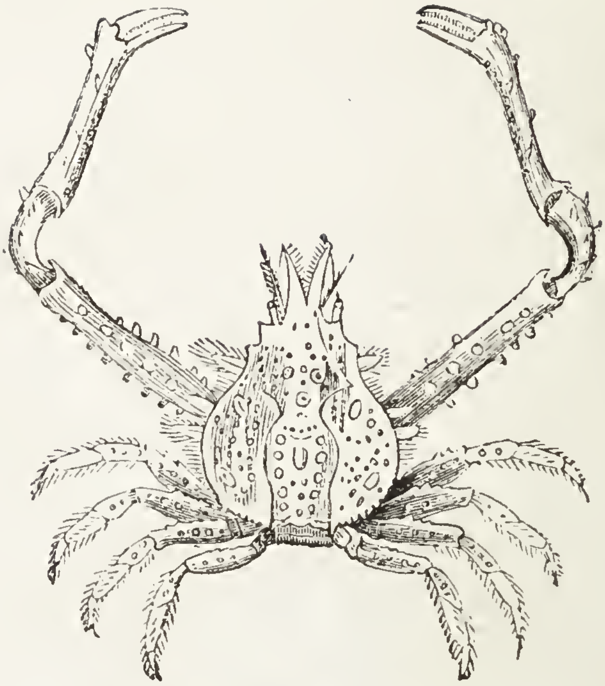

FIG. 24. *Eurynome aspera* (male).

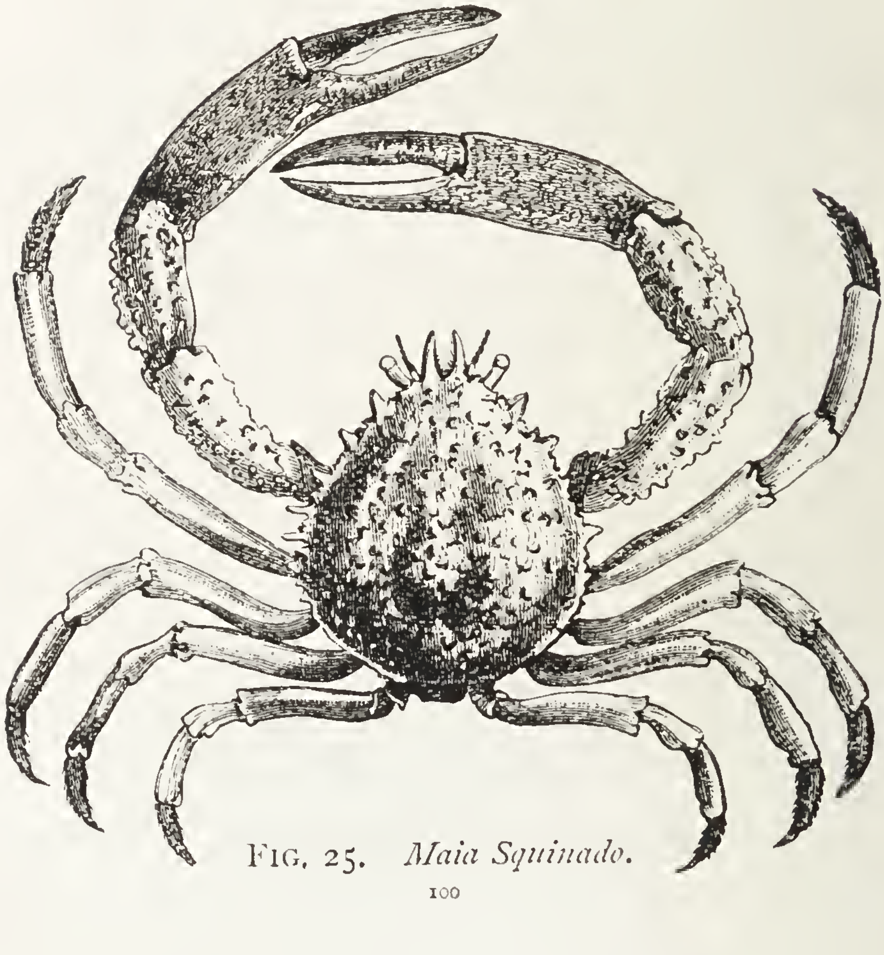

FIG. 25. *Maia Squinado.*

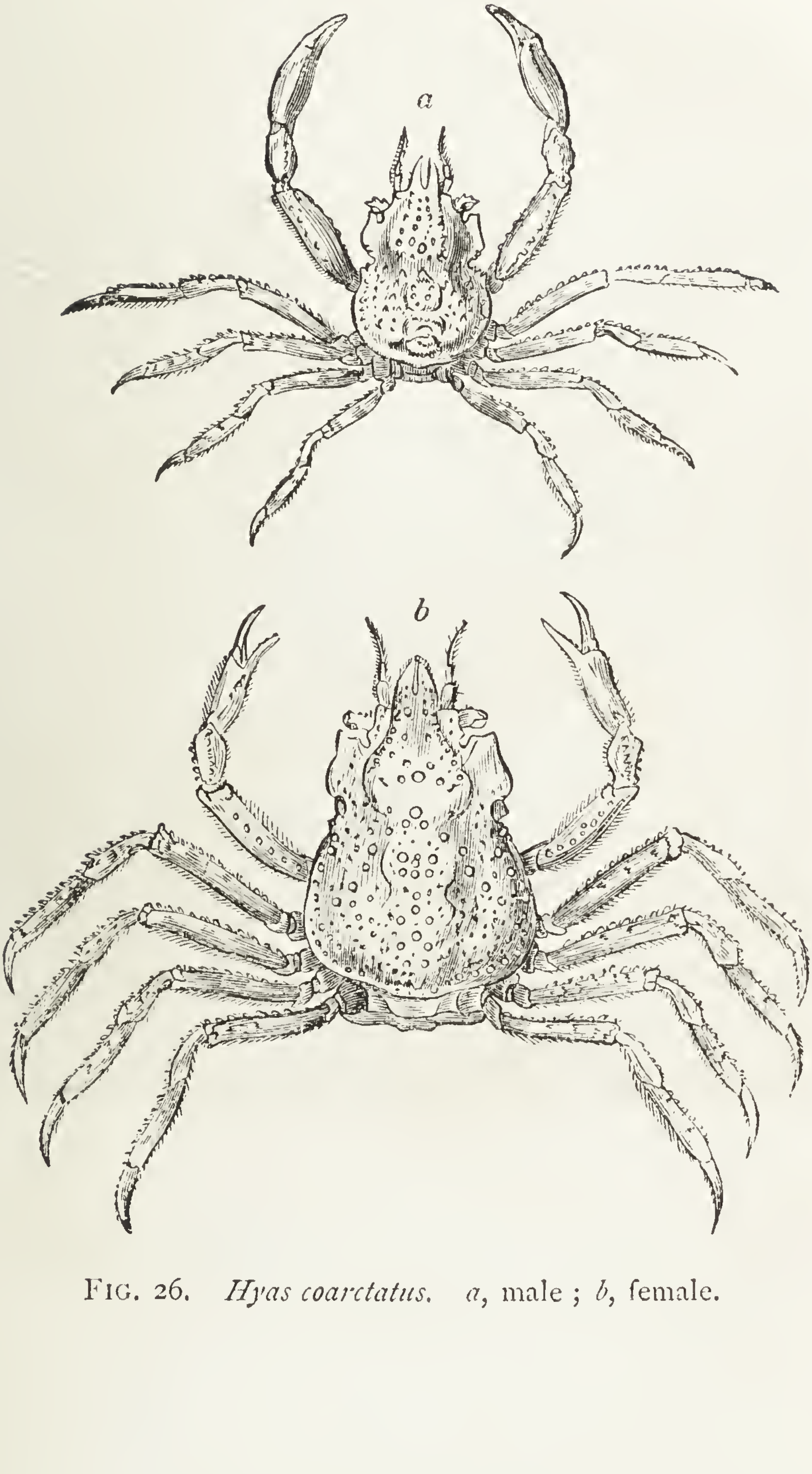

FIG. 26. *Hyas coarctatus.* *a*, male ; *b*, female.

### *Fam.* 10. *Leptopodiadæ.*

Outer antennæ short and slender; inner antennæ placed in grooves. Legs very slender and very long. Front pair rather thicker and shorter than the rest. Well-formed claws. The four hinder pairs of legs simple. Carapace triangular, sparingly tuberculous, and produced into a bifid beak.

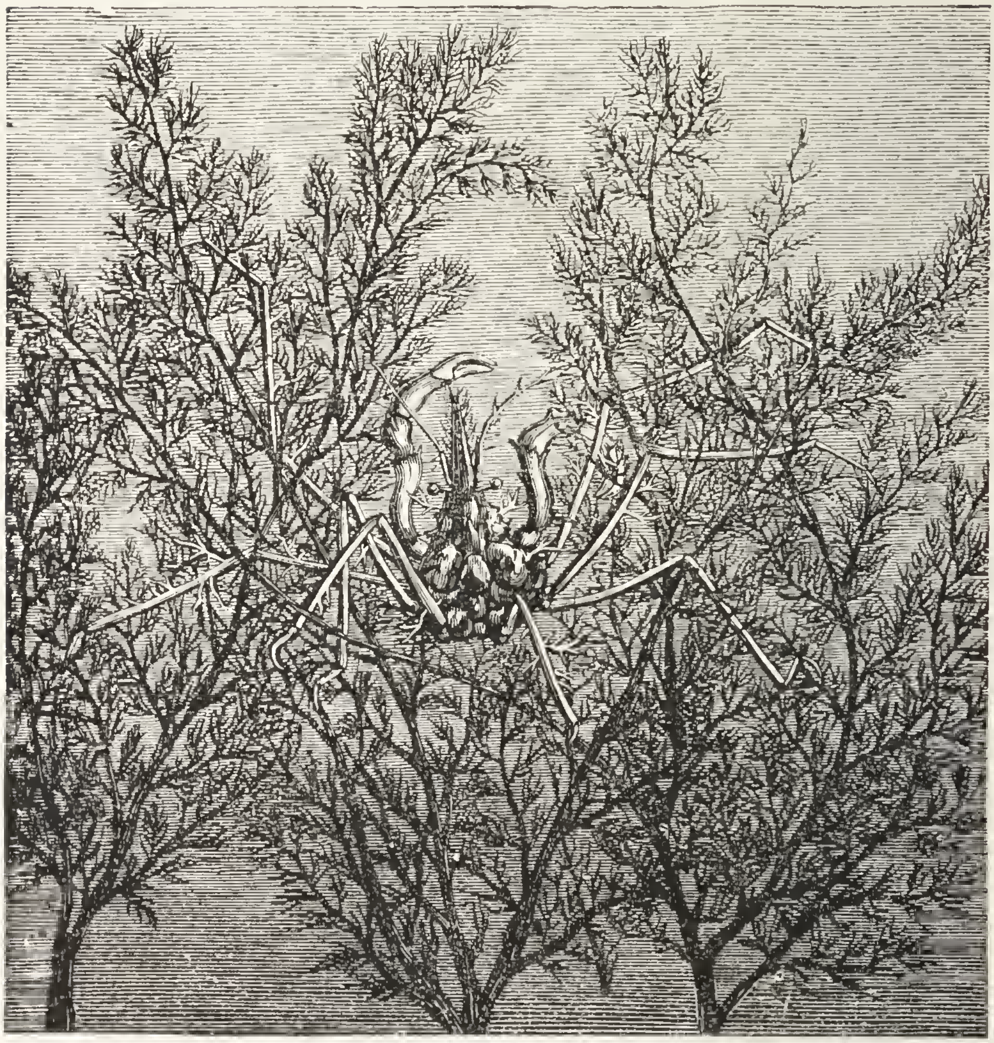

FIG. 27. The slender-beaked spider crab (*Stenorhynchus tenuirostris*).

Includes *Inachus*, *Acheus*, and *Stenorynchus*.

## Part 2. SPIDERS.

The class *Arachnida* is a very large one, containing an immense variety of forms, from the formidable scorpions down to an order including a number of very small and curious marine animals, which have been regarded by different authors either as *Arachnida* or *Crustacea.* It is with the true spiders, or fifth order of Arachnids, that we are concerned.

### Order 5.—Araneida, or True Spiders.

The true spiders exhibit a great variety in their mode of life. Many of them dwell on the surface of the ground, concealing themselves under stones, amongst lichens, or in burrows dug by themselves; others live in the crevices of rocks and walls, or suspend themselves in mid-air from the branches of trees. One makes for itself a sort of balloon, in which the little aëronaut mounts up above its fellows; whilst a few, keeping their bodies inclosed in a bubble of air, live in stagnant waters.

The legs are connected by joints with the cephalothorax; they are seven-jointed. Respiration is effected by peculiar lung-sacs, whilst simple tracheæ are still frequently present. The breathing apparatus is situated on the lower side of the abdomen, near the base.

British spiders may be conveniently divided into two tribes, according to the number of their eyes.

## TRIBE I. *SENOCULINA* (SIX-EYED)

This is a small tribe, containing but four genera, and not many more species. Some live by hunting, others apparently make snares for obtaining their prey.

### *Fam.* I. *Scytodidæ.*

Maxillæ slender, pointed, and enlarged at the base. Eyes placed in three widely separated pairs, marking a half-circle, one pair being in front. Legs very long and slender; first and last pairs are the longest, the third pair the shortest. Abdomen egg-shaped. Female is quarter of an inch in length. Contains the single genus *Scytodes.*

### *Fam.* 2. *Dysderidæ.*

Maxillæ long. Eyes closely grouped in the form of a small oval. Legs moderately long; first and last pairs are the longest; third pair the shortest. Abdomen egg-shaped, slightly overhanging the cephalothorax.

Comprising the genera *Oonops*, *Schœnobates*, *Segestria*, and *Dysdera*.

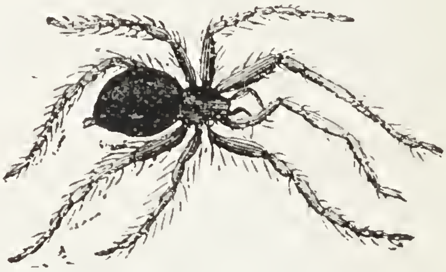

FIG. 28. Oonops pulcher (Length $\frac{1}{13}$ inch).

## TRIBE 2. *OCTONOCULINA* (EIGHT-EYED).

This embraces ten families. The first five ensnare their prey, the second five obtain their sustenance by hunting. All have three pairs of spinnerets, except in the family Ciniflonidæ, which has four pairs.

### *Fam.* 1. *Epeiridæ.*

Maxillæ short, strong; base small; tip large and rounded. Eyes in three groups. Four are arranged in a square, having two placed on a small protuberance on each side. Legs long, the third pair being the shortest. Abdomen overhanging the anterior division of the body, oval, nearly globular, or flattened. Often hairy humps.

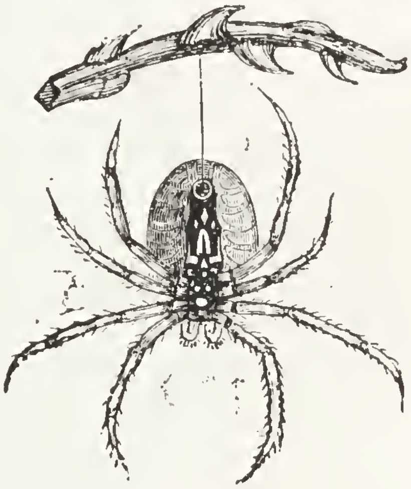

FIG. 29. Epeira diadema.

Containing two genera, *Tetragnatha* and *Epeira*. The latter has thirty-one species.

### *Fam.* 2. *Linyphiidæ.*

Maxillæ of a square form, often swollen. Eyes in two rows; two centre eyes of the front row near together. The lateral eyes near together. Legs long and thin; first and last pairs the longest. Abdomen rather egg-shaped in the female, often cylindrical in the male. Overhanging the cephalothorax.

Comprises the genera *Pachygnatha*, *Walckenæra*, *Neriene*, and *Linyphia*. Upwards of one hundred species known in Great Britain.

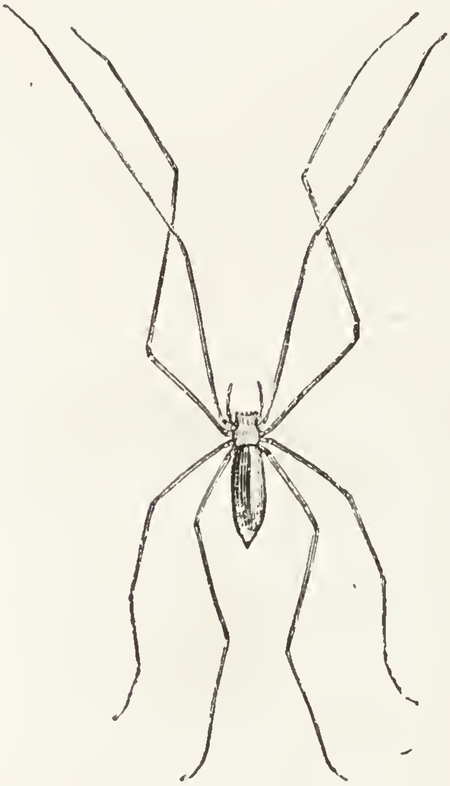

FIG. 30.
Pholcus phelangioides.

### *Fam.* 3. *Theridiidæ.*

Maxillæ long, and leaning towards each other. Eyes in two rows; side eyes on tubercles. Four eyes in the centre forming a square. Legs long and slender; first and last pairs are longest; second pair longer than the third. Abdomen overhanging, globular or angular, and often dentated in front.

Contains the genera *Pholcus* and *Theridion.*

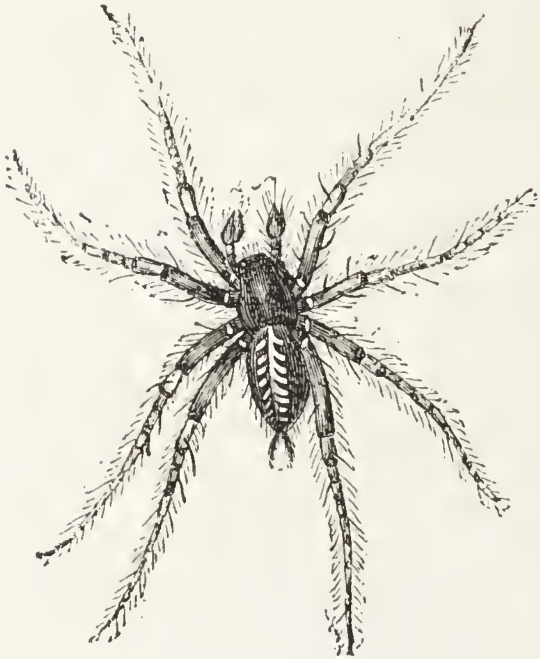

FIG. 31. Agelena labyrinthica.

### *Fam.* 4.

### *Agelenidæ.*

Maxillæ short. Eyes in two rows, curving towards the front. Legs rather long, moderately robust. Abdomen overhanging, egg-shaped. Comprising *Textrix*, *Cœlotes*, *Tegenaria*, and *Agelena*.

### *Fam.* 5. *Ciniflonidæ.*

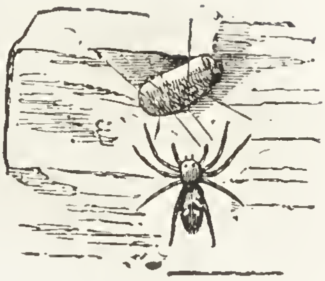

FIG. 32.
Ergatis benigna.

Maxillæ long, rounded at the end. Eyes arranged so as to form nearly an oval, almost of the same distance apart. Legs robust, first and last longest; second longer than the third pair. Abdomen overhanging, and of oval shape.

Contains the genera *Velcda*, *Ergatis*, and *Ciniflo.*

### *Fam.* 6. *Drassidæ.*

Maxillæ long and of different forms. Eyes in two lines, curved towards the front. Legs robust. Abdomen oval, sometimes overhanging the cephalothorax.

Comprises *Argyroneta*, *Clubiona*, and *Drassus.*

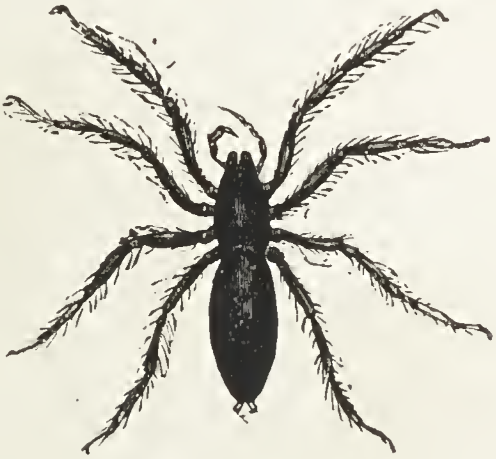

FIG. 33. Argyroneta aquatica.

### *Fam.* 7. *Thomisidæ.*

Maxillæ short and rather pointed. Eyes in two rows, curved towards the back; the four lateral eyes are the largest. Legs long; the two first pairs being

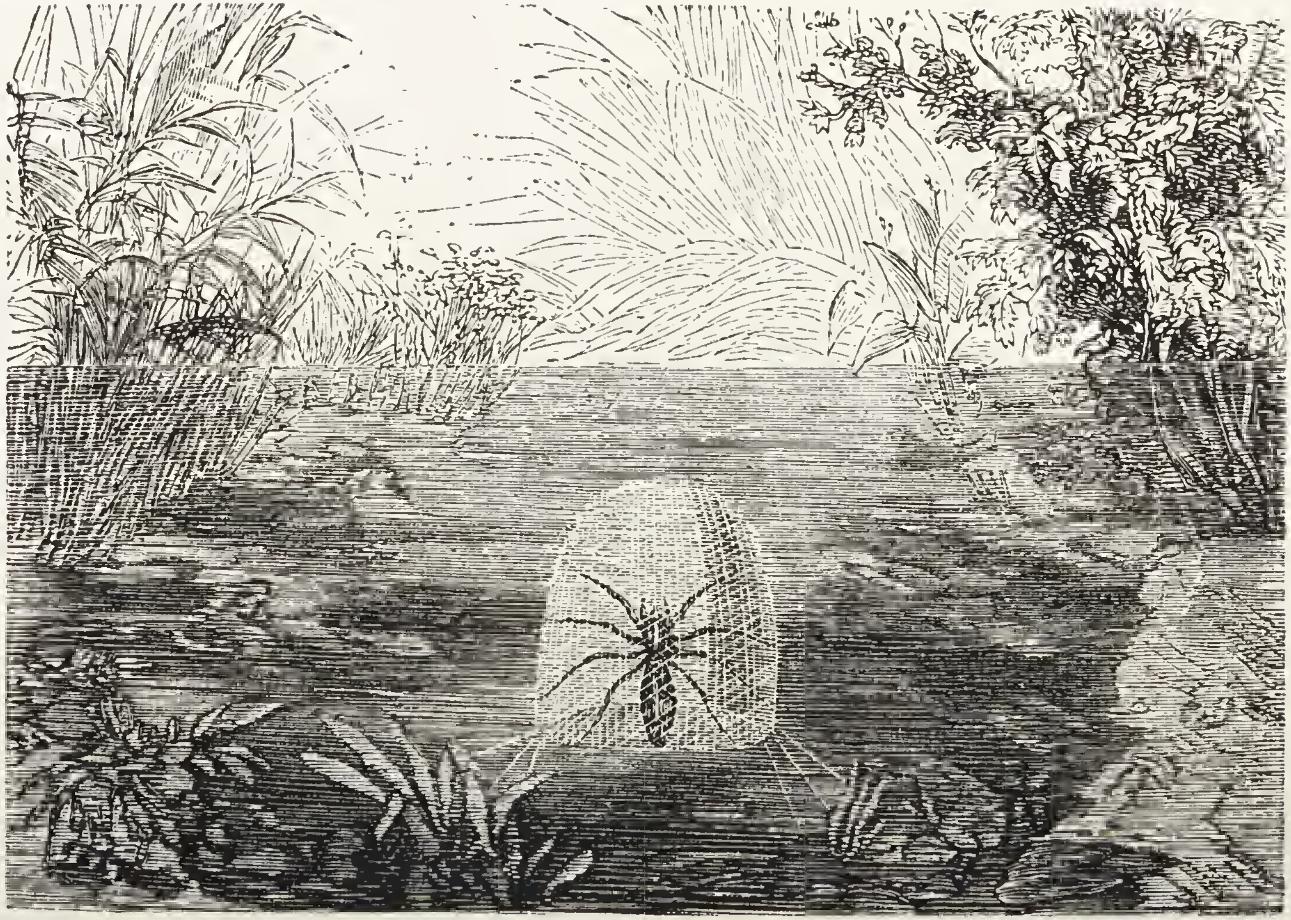

FIG. 34. Argyroneta and nest.

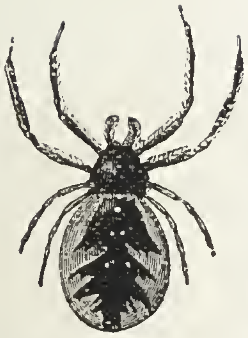

FIG. 35. Thomisus audax.

much the longest. Abdomen broad and short. Broadest behind or in the middle.

Containing the genera *Sparassus*, *Philodromus*, and *Thomisus*.

### *Fam.* 8. *Salticidæ.*

Maxillæ long, and rounded at the tip. Eyes in three rows; first row containing two eyes close together; two eyes of the second row close behind the first; two widely separated, and forming a quadrangle with the remaining two. Legs short and hairy. Abdomen egg-shaped.

Comprising the two genera *Salticus* and *Eresus*.

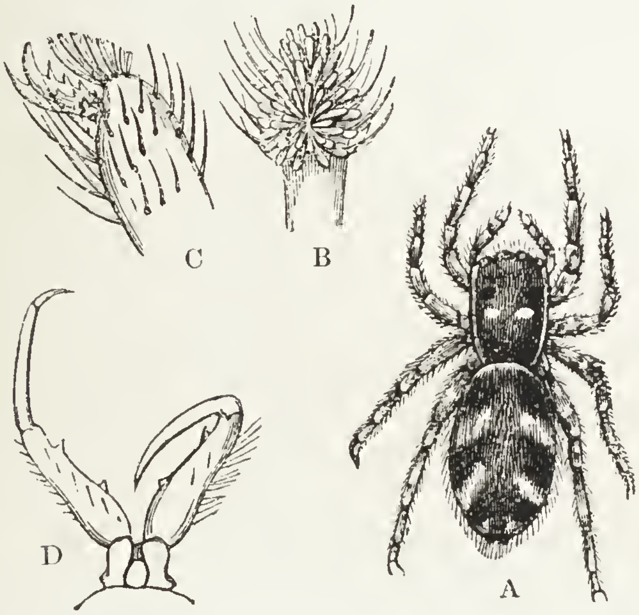

FIG. 36. Salticus scenicus. Length, a quarter of an inch. A, female, enlarged; B, foot from below, with scopula; C, foot from the side; D, falces of male.

### *Fam.* 9. *Lycosidæ.*

Maxillæ rather club-shaped. Eyes in three rows; first row containing four small eyes; remaining four eyes larger, forming a square. Legs robust and hairy; first and second pairs longest. Abdomen egg-shaped and overhanging; smaller and more slender in the male.

Contains *Sphasus*, *Hecaërge*, *Dolomedes*, and *Lycosa*.

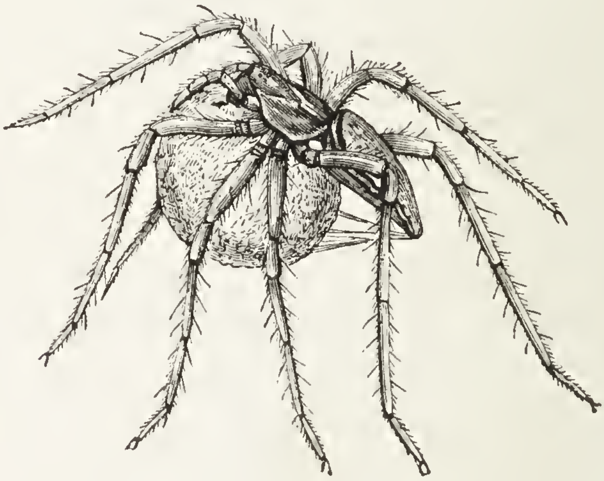

FIG. 37. Dolomedes mirabilis. Female, with egg-bag (enlarged).

### *Fam.* 10. *Mygalidæ.*

Maxillæ long and divergent. Eyes, four large and four small. The four large form a crescent above the face, behind each end-eye are two small eyes. Legs short and robust; first and last longest. Abdomen oval shaped.

A single genus, *Atypus*. Only one species is found in Great Britain; but this is an extensive family, and comprises some of the largest spiders abounding in hot climates.

# CHAPTER V.

## *COLLECTING.*

Before beginning to form a collection of Crustacea, spiders, or any other natural history specimens, it is essential that the student should clearly understand the aim in view. If his only object in making a collection is to merely accumulate a number of specimens to which he can attach Latin names—if his collection is to be regarded in the same way as a collection of coins or postage stamps—then let him satisfy his propensity for gathering together a variety of objects in the function of a stamp collector, for he lacks the spirit of a naturalist. What then is, or should be, the aim of a collector of Crustacea or spiders? His chief aim should be to trace out the life histories, instincts, and structure of the creatures coming under his notice; in short, he should be more an observer than a collector. A collection should serve as a sort of dictionary, putting the student in the power to ascertain the name of any given creature, and thus to learn what has been observed respecting its properties and history; and it should also serve to make the student acquainted with the principles on which classification is founded. But, further, he has no right to destroy indiscriminately and purposely any of the living creatures that inhabit the earth.

"They are as free to enjoy as we to live."

Why should we wantonly cut short their little span of existence, and then suffer them to decay, useless alike to ourselves and others?

There are many objections alleged by the ignorant against the practical naturalist. By some he is derided as a trifler, and his pursuit is deemed a waste of time and talent; by others he is reprobated as unfeeling and cruel. We shall do well to glance at these objections, with a view to remove such misconceptions. Why do so many learned men pay so much attention to any particular branch of science? Surely it is on account of some profit and instruction that may be derived from it. Who dare maintain, unless he has the audacity to deny that they are the handiwork of the great Author of all nature, that the study of crabs and spiders, and their ways, is trifling and unprofitable? I have already dilated somewhat upon the subject of *cui bono?* In regard to the charge of cruelty, I think all will admit that man enjoys a right to take the life of any of the inferior animals, if in so doing he ministers to his own pleasure or well-being. Not until the sportsman abandons his game shooting, and the lady gives up the unnecessary adornment of her bonnet with the feathers of beautiful birds, will I relinquish my right to take the lives of the humbler creation for a far nobler motive.

In the chapter on "paraphernalia" the student is made acquainted with all the essential apparatus required for collecting, and the method of killing; he must now be instructed how to go about collecting.

Never go out without a note-book, in which everything of importance relating to a capture should be noted at the time, especially the locality, date, and mode of taking. Any such remarks, however insignificant they may appear at the time, will probably become of the utmost importance eventually, as well as being of great value for the help of others. It is very desirable that a journal should also be kept at home for detailed descriptions of specimens, besides a copy of the records from the note-book. Every specimen in the collection should bear a number corresponding to one in the journal.

The use of the crab-net will require no comment: it will be better to leave the collector to find out for himself as to its manipulation, which he will very quickly do. As a dress for crabbing I strongly recommend thick woollen clothes, a felt hat, and a pair of easy boots replete with holes for letting out the water. A number of steel nails should be driven into the soles of the boots, in order to prevent slipping on the sloping rocks and the dark olive-green vegetation with which they are generally covered. It is just those rocks (covered by the waves at high tide) most prolific in pools, where the collector should go to find Crustaceans. This slimy *fuci* too frequently covers a deep hollow or a sharp point, of which a special precaution should be taken; with an approaching tide a disabling accident would be probably attended with dire results. It is never advisable to take a watch, keys, or a pocket-knife of any value on such an excursion; but a common knife and a good store of string for repairs must not be forgotten. The best time for collecting is when the tide is at its lowest. Twice in twenty-four hours the water advances and recedes, so there is at least one opportunity for the collector to follow the retiring waves. The sea rises or flows for about six hours; in about a quarter of an hour the fall or ebb commences, and continues for six hours more; after another apparent interval of rest, the flow returns as before, so that in about twenty-four hours the flux and reflux are twice repeated, or two tidal waves accomplish their rise and fall in that interval. The impelling cause of tides is astronomical, the attractive influence of the sun and moon, but principally that of the moon, owing to her nearer distance. The tides are greater than ordinary twice every month, at the times of new and full moon, and are called spring-tides, the sun and moon then acting in concert. The water recedes considerably below their usual mark, so making these seasons harvest-times for the crustaceologist. About six hours after the high tide he should carefully investigate the lowest boundary, and he will find much to reward his labours; as good results are often obtained at these seasons in a very short time as at dredging for a much longer period. If possible, do your collecting in the early morning, so as to leave more time for attending to the cleaning and setting of specimens at home.

It is always a good plan to make friends with the fishermen, and to pay them small sums for the specimens that they obtain for you. A few pence always make a great deal of difference; the friendship will be more lasting, hence the specimens more numerous. On no account let him know that certain crabs are more rare than others, or he may strike an extra bargain for "good luck." Be especially amorous to fishermen possessing lobster-pots and trawl-nets; many a desirable specimen is often entrapped in the latter, though looked upon by the men as rubbish.

A very good collection may soon be made with a dredge, not to mention the pleasure that may be derived from this method of obtaining Crustacea.

With a rowing boat it is not easy to dredge at a greater depth than from ten to fifteen fathoms. For a depth of ten fathoms it would be necessary to let out about twenty fathoms of rope, or twice the length of the depth, so as to insure the dredge scraping the sea-bed properly. The more rope let out, the deeper the blade of the dredge scrapes. It should glide along the bottom, and not too deeply into it. If the seabed be of gravel and sand, it will be found the most productive of good specimens, and infinitely more easy to work than any other. The net should be hauled up about every ten minutes or quarter of an hour, when it will be found clogged with seaweed and "fry innumerable," huddled up at the bottom. Having selected the creatures you wish to retain, do not forget to return the rest to their natural element.

A few observations with reference to spider collecting will close this chapter. Any spider may, with practice, be taken in pill-boxes; an adept will box them with one hand, by pressing one side of the lid and box against the thumb, using that side as a sort of hinge, and separating the lid from the box on the other side by means of the fore-finger for the box and the second finger for the lid, at the same time holding his net underneath, if the spider is in an elevated position, in order to catch it should it drop. There is no small difficulty attached to spider catching, as the collector will soon discover; some will fall straight down from a branch and feign death, others will fall down and then scamper off. Some, again, will not fall down, but run away swiftly along the branches. The different families have various ways of escaping the hand of the collector, and he must carefully notice how he *missed* a species, that he may have better success another time; and notes as to the method ot capture of species are valuable entries for the journal.

Plenty of spiders may be caught by dragging the net through the low herbage under hedges; but a great drawback to this way of taking them is, that, although we may capture an abundance of species, we cannot tell what their webs are like, besides many other things we should have been able to note, could we have first seen the creatures undisturbed. Many specimens may be obtained by holding the net beneath trees and bushes whilst they are beaten.

> "Go, child of nature, to thy mother's breast,
> And learn the lesson she can teach so well;
> No longer in the lap of folly rest,
> But hear the truths that nature loves to tell."

# CHAPTER VI.

## *USES.*

Every living creature is said to have its use, its beneficial part to play in the economy of nature. The edible Crustaceans of our shops fulfil an important mission in this respect. They supply the majority of us with a much appreciated dainty, and they stand almost unrivalled as scavengers of the "briny." It may not however be very palatable to contemplate, that the delicious claw we are eating with such a relish was, perhaps less than twenty-four hours ago, used as a very forcible argument in favour of its possessor's rights to a share in the disintegration of the lifeless body of some unfortunate mariner, no matter how advanced the stage of decomposition.

Nearly one hundred thousand crabs and lobsters are sold in London every year by some of the leading fish dealers, so that these creatures assist very materially to increase our supplies of food. It would be utterly out of the question to try and enumerate the number of shrimps and prawns consumed annually in our metropolis. Many of the lower forms of Crustacea assist considerably in contributing indirectly to our wants. They constitute the food of vast shoals of fish and multitudes of sea-birds. The principal food of *Salmo salar* and some other migratory members of the family *Salmonidæ*, when on their long sea voyages, consists of Crustacea, and the count-less myriads of opossum shrimps of the arctic seas serve to support and fatten the Greenland whale (*Balæna mysticetus*). When the whale feeds it swims rapidly just under the surface of the water, with its huge mouth wide open. The water, with its many thousands of opossums, rushes into the immense cavity and filters out at the sides between the plates of the whalebone, leaving behind every particle of solid matter.

From a utilitarian point of view, we must admit that the various Crustaceans help in a great degree to furnish man with food, and add to his wealth. We must also admit that, to the naturalist, these creatures afford an abundant fund of delightful inquiry. What enjoyment may be derived from a study of their peculiar habits, structure, and instincts! In this respect I contend they may be truly said to be of use.

Nothing is created in vain; and Columbus, with all his skill and power as a sea commander, gladly availed himself of the services of a tiny crab. Large numbers of the Gulf-weed crab, *Planes Linnæana*, were found by Columbus on the *sargossa* floating in the sea, from which he concluded himself not far from some land. "A crab!" said he; "a good and fair harbinger of land, which, with God's help, we shall soon discover." Very soon after this the West Indian islands were fallen in with and investigated.

At one time "crab's eyes" were collected in vast numbers, and sold for medicinal purposes as sovereign remedies for all sorts of disorders. These bodies are to be found inside the stomach of crabs, just before *ecdysis*, or moulting, sets in. They are smooth and flattened on the side which is turned towards the cavity of the stomach; while the opposite side, being convex and rough with irregular prominences, is something like a "brain-stone" coral. The "crab's eyes," or *gastroliths*, as they are called, are cast off when moulting takes place, into the cavity of the stomach, and are there dissolved. They consist almost entirely of calcareous matter, which is very probably used up in the formation of the new exoskeleton. Their real utility as a medicine, inasmuch as they consist chiefly of carbonate of lime, is much the same as that of carbonate of magnesia.

The spiders, viewed with such disgust and aversion by the generality of mankind, must next be briefly considered. Their ferocious habits, the sinister appearance of some, and the venomous qualities of others, combine to insure a bad reputation for them, and seem to overbalance their good qualities and any utility to man in such a degree, in popular opinion, that to stand up in their defence seems almost preposterous. That the spider is most unjustly abused I will endeavour to show.

It is undeniable that spiders are ferocious in their habits, the males fighting with great fury, and the females, usually by far the stronger beings, frequently devouring their partners. The writer of an excellent essay on spiders quaintly says: "Their honeymoon is of short duration, and is terminated by the bride banqueting on the bridegroom. Doubtless she evinces taste and discrimination in her appreciation of a 'nice young man.'" I will not make any further comment on this latter practice amongst the wives of spiders, than remark that it is very analogous to a custom prevalent amongst some low tribes of humanity, who think it their bounden duty to relieve their aged parents of the troubles of this world by drowning them. We must not censure a quality innate, as it were, in any creature, just because it differs from our own standard of propriety.

No British spider is capable of causing a poisoned wound of any severity upon man, as are some of the exotic species, although their wounds appear to be very speedily fatal to the small creatures upon which the spiders prey. Is not this venomous power an instance of wise provision, enabling the spiders to mercifully paralyse their prey in killing? Spiders and insects, for their diminutive size, are, many of them, the most valiant animals in nature. Their weapons, fearful as they look, would be of but little use to them if they had not courage to employ them. The giant bulk of an elephant would not deter a spider from attacking it. Not that the spider could in reality inflict a punishment on so large and strong an animal. The frightful aspect of certain insects is a favourable means of defence. The terrific and pretended jaws of the stag-beetle, quite harmless in themselves, strike beholders with alarm.

We are told that spiders were included in the list of pernicious animals supposed to have been banished from the Emerald Isle.

> "Happy Iërne, whose wholesome air
> Poisons envenomed spiders, and forbids
> The baneful toad and viper from her shore."

While on the other hand, the Kentish proverb,

> "If you wish to live and thrive,
> Let a spider run alive,"

seems to connect this creature with man's prosperity.

Several instances have occurred in which the spider has proved itself sensible to kindness. A Frenchman has tamed and kept hundreds of spiders; the learned Magliabecchi, librarian to the Duke of Tuscany, showed more love for spiders than for any other living creature. It cannot be said of the spider that "he has no music in his soul." Indeed so partial are they to it, that they have been known to come repeatedly from their haunts during musical performances, and even perch themselves upon the instrument played, returning at the cessation of the music.

Curative properties have been ascribed to both the spiders and their webs; in some rural districts the creatures themselves were considered to be a cure for ague. Eleazar Albin states that he has cured several children of agues "by hanging a large spider confined in a box about their necks, reaching to the pit of the stomach, without giving any internal remedies." Some years ago a lady in Ireland was famous for her success in curing persons affected with ague. She employed a bolus composed of a spider carefully enveloped in treacle. Similar beliefs as to the efficacy of this dose formerly prevailed in Lincolnshire and other parts of England. Many other "spider" prescriptions might be adduced, all equally incredible as far as healing is concerned.

Several attempts have been made to manufacture the cocoon silk spun by the spider, and all attended with very poor results. M. Bon, a Frenchman, and M. Tremezar, a Spaniard, spent years in trying to domesticate spiders for manufacturing purposes. The only outcome of all the experiments seems to have been the production of a few silk waistcoats, gloves, and stockings.

Spiders are not to be excluded from the list of dainties. Some one has said "bold was the man who first ventured to eat a raw oyster"; we cannot help wondering what this "some one" would say about eating spiders. M. Réaumur was acquainted with a young lady who used to eat spiders as fast as she could capture them. A German lady has eaten them like nuts, which she declared they resemble in flavour; and M. Lalande, the celebrated astronomer, was equally fond of these delicacies. Rözel was acquainted with a gentleman who used to spread them upon bread as a luscious substitute for butter. Most of us are more or less slaves of prejudice. Why should a spider be not equal to a shrimp, or a death's head moth to a carrion-feeding crayfish? We English are disgusted with the idea of eating the flesh of the horse or ass, and as for eating land snails, we would as soon swallow a centipede; yet the centipedes are eaten with relish by the Indian natives. We eat oysters, cockles, mussels, and periwinkles, but not land or fresh-water snails; we eat eels, but not snakes, delicious as the latter are accounted by the natives of other countries; we eat crabs, lobsters, crayfish, prawns, and shrimps, but neither insects, scorpions, nor spiders: but the cheese mites, which are allied to the latter, are in great demand by the epicure.

Spiders confer no small benefit upon man in keeping within due bounds the exuberant swarms of insect life. They serve as an article of food for many birds and other animals, although not yet included in our *table d'hôte.*

# CHAPTER VII.

## *THE CABINET.*

THE choice of a suitable receptable for a collection is always a serious question for the beginner. Let him not think that a beautiful mahogany cabinet is, in the first place, a necessity ; it should be looked upon merely as a luxurious adjunct wherein to keep his treasures, the collection being quite as valuable and as useful when kept in ordinary cardboard or wooden boxes. The writer has frequently, when showing one of his collections, been much annoyed to find a cabinet to be as much, or more the object of admiration than its contents, no matter how unparalleled the specimens. In answer to the interrogation, "Do you not think that specimen a fine one?" The reply often is, "Yes ; but are not the drawers made of splendid Spanish mahogany!" "Is not that crab wonderfully adapted for swimming?" "Indeed it is. I suppose mahogany is well suited for the purpose of making cabinets."

The collector of crabs will find that a number of chocolate boxes, of various depths, will answer the purpose of a cabinet very well indeed. The ordinary deal store boxes sold for entomological collections can scarcely be excelled for the purposes of the crustaceologist. One drawback is, that they will only hold the small or medium-sized species. However the first specimens, the nucleus of the future great collection, may be kept well enough in an assortment of boxes, till a real cabinet can be compassed. Crabs must never on any account be kept in uncovered glass cases, as their colours will fade when exposed to the light, especially to the direct rays of the sun. The specimens must be secured to the bottom of the box by means of stout pins. If a crab is gummed to a card, one short pin, or a pin-point, at each corner, is a neat way to secure it. Should it not be "carded," it will be necessary to pin the legs. Two pins stuck across each leg (not through it), so as to form a sort of little staple, is the plan generally adopted. A piece of camphor should be kept in each box, to keep away intrusive mites, or even the larger parasites which destroy collections, such as the larvæ of some small beetles and moths. The boxes are to be covered with pure white paper at the bottom, which should be attached with thin paste. Small labels should be pinned down at the foot of each species, giving its *specific* name, the name of the genus being placed at the head of the first species of the genus. It is well to have a considerable number of specimens of each species, especially when it is one liable to much variation in size or colour. A male and female, exhibiting the under side, should if possible complete the series. Each specimen should be ticketed with a small piece of paper gummed underneath it, bearing a number corresponding with the collector's journal, which will give its complete history, time of capture, and other notes.

Although this book does not take up the description of species, except when it is necessary for identification of a few genera, yet it is well that I should give the above observations with regard to their arrangement in a collection, as I fear the student may be at a loss to know how to proceed when he goes more deeply into the study. The student should first try to secure as many genera as possible, and learn all he can about them with the aid of this book; then he may take up a book like Bell's "British Stalk-eyed Crustacea," to become acquainted with the species. But he will not find that a standard work of this sort gives any directions as to the formation of a collection, hence I do so here.

When the student has mastered the genera, not before, and when he has collected a large number of species, if he has £15 or £20 to spare, and wishes to "go in" for a cabinet, he may do so with advantage. It is important that he should know the species, or at least their sizes, before having a cabinet made for them, as the drawers will have to be of different depths. If he is careful in this respect, allowing for a very fair number of specimens, he will find twelve drawers of about eighteen inches square will hold all the British species. Of course some definite system of classification must be consulted in order to ascertain when the deep or shallow drawers will come in.

Well seasoned mahogany or deal may be the material for the drawers. The glasses which cover in the drawers should always have separate frames for the more perfect exclusion of dust and mites.

Before placing specimens in a cabinet I would recommend that the paper should be painted with the following paint. It is whiter than paper, and improves the appearance of the drawers when properly applied; it also seems to deter mites from attacking the specimens. Dissolve about a drachm of isinglass in half a pint of boiling water. Let this solution stand until cool; then remove the clear jelly; warm this, and mix it with the best oxide of zinc, and an additional half pint of water, until it is of the consistency of cream; stir in until perfectly mixed an almost imperceptible amount of ultramarine blue, which seems to make the mixture more white, and an addition of two grains of powdered white arsenic is useful. Take the drawer to be painted and warm it at a fire, and have the paint over the fire in a jar standing in a saucepan of water. With a flat, fine-haired brush about two or three inches in width, and while both drawer and paint are warm, paint the drawer first from side to side, and then from front to back. Take care to put on the paint as evenly as possible. Then turn the drawer down to keep out the dust, and allow it remain for about twenty-four hours for the paint to dry, in a warm room.

A collection of spiders may be very easily arranged. If the tubes containing the specimens are mounted on cards (see chap. i.), the common deal cabinets sold by natural history dealers suit admirably for their reception, it being only needful to secure them in the drawers by means of pin points at the corners. The name of the species may be neatly written at the bottom of the card; the genus at the top. Of course here again ordinary shallow boxes will answer all practical purposes, just as well as a cabinet. Without the cards, the tubes can be conveniently arranged in boxes containing two or more inverted trays, with round holes cut in them of a size to allow the tubes to pass through as far as their curved edge or mouth. This plan does not, to my mind, make reference to the specimens very easy, as the names have to be written very small, on the tops of the corks.

# TABLE OF CLASSIFICATION OF BRITISH CRABS AND SPIDERS.

## *DECAPODA AND ARANEIDA.*

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### SUB-KINGDOM—ANNULOSA.

### DIVISION III.—ANTHROPODA.

### Class I.—CRUSTACEA.

### SUB-CLASS III.—MALACOSTRACA.

### DIVISION B.—PODOPHTHALMATA.

### Order I.—STOMATOPODA.

Fam. 1. *Squillidæ.*—(Squilla.)
,, 2. *Mysididæ.*—(Cynthilia. Themisto. Mysis.)

### Order II.—DECAPODA.

TRIBE I.—*MACROURA.*

Fam. 1. *Diastylidæ.*—(Bodotria. Alauna. Cuma.)
,, 2. *Penæadæ.*—(Penæus. Pasiphæa.)
,, 3. *Palæmonidæ.*—(Palæmon. Pandalus. Hippolyte.)
,, 4. *Alpheadæ.*—(Athanas. Nika. Alpheus.)
,, 5. *Crangonidæ.*—(Crangon.)
,, 6. *Astacidæ.*—(Nephrops. Homarus. Astacus.)
,, 7. *Thalassinadæ.*—(Calocaris. Axius. Gebia. Callianassa.)
,, 8. *Palinuridæ.*—(Palinurus.)
,, 9. *Scyllaridæ.*—(Scyllarus.)

TRIBE II.—*ANOMOURA.*

Fam. 1. *Porcellanidæ.*—(Munida. Galathea. Porcellana.)
,, 2. *Paguridæ.*—(Pagurus.)
,, 3. *Homoladæ.*—(Lithodes.)
,, 4. *Dromiadæ.*—(Dromia.)

TRIBE III.—*BRACHYURA.*

Fam. 1. *Corystidæ.*—(Corystes. Atelecyclus. Thia.)
,, 2. *Leucosiadæ.*—(Ebalia.)
,, 3. *Grapsidæ.*—(Planes.)
,, 4. *Gonoplacidæ.*—(Gonoplax.)
,, 5. *Pinnotheridæ.*—(Pinnotheres.)
,, 6. *Portunidæ.*—(Polybius. Portunus. Portumnus. Carcinus.)
,, 7. *Canceridæ.*—(Pirimela. Pilumnus. Cancer. Xantho.)
,, 8. *Parthenopidæ.*—(Eurynome.)
,, 9. *Maiadæ.*—(Maia. Hyas. Pisa.)
,, 10. *Leptopodiadæ.*—(Inachus. Achæus. Stenorynchus.)

## Class II.—ARACHNIDA.

### Order V.—ARANEIDA.

TRIBE I.—*SENOCULINA.*

Fam. 1. *Scytodidæ.*—(Scytodes.)
,, 2. *Dysderidæ.*—(Oonops. Schœnobates. Segestria. Dysdera.)

TRIBE II.—*OCTONOCULINA.*

Fam. 1. *Epeiridæ.*—(Tetragnatha. Epeira.)
,, 2. *Linyphiidæ.*—(Pachygnatha. Walckenæra. Neriene. Linyphia.)
,, 3. *Theridiidæ.*—(Pholcus. Theridion.)
,, 4. *Agelenidæ.*—(Textrix. Cœlotes. Tegenaria. Agelena.)
,, 5. *Cinifionidæ.*—(Veleda. Ergatis. Ciniflo.)
,, 6. *Drassidæ.*—(Argyroneta. Clubiona. Drassus.)
,, 7. *Thomisidæ.*—(Sparassus. Philodromus. Thomisus.)
,, 8. *Salticidæ.*—(Salticus. Eresus.)
,, 9. *Lycosidæ.*—(Sphasus. Hecaërge. Dolomedes. Lycosa.)
,, 10. *Mygalidæ.*—(Atypus.)

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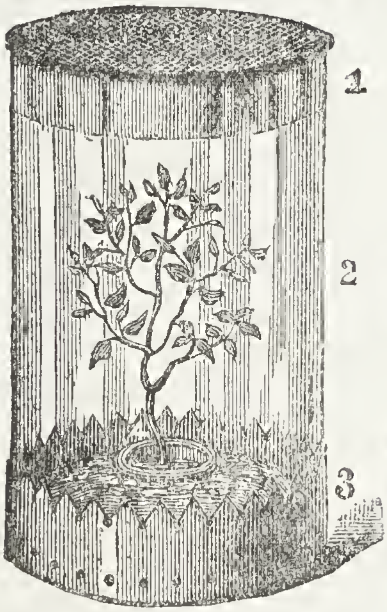

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